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Rock Products

Volume XXVII Chicago, October 4, 1924 Number 20

Washes Entire Output of Crushed Stone

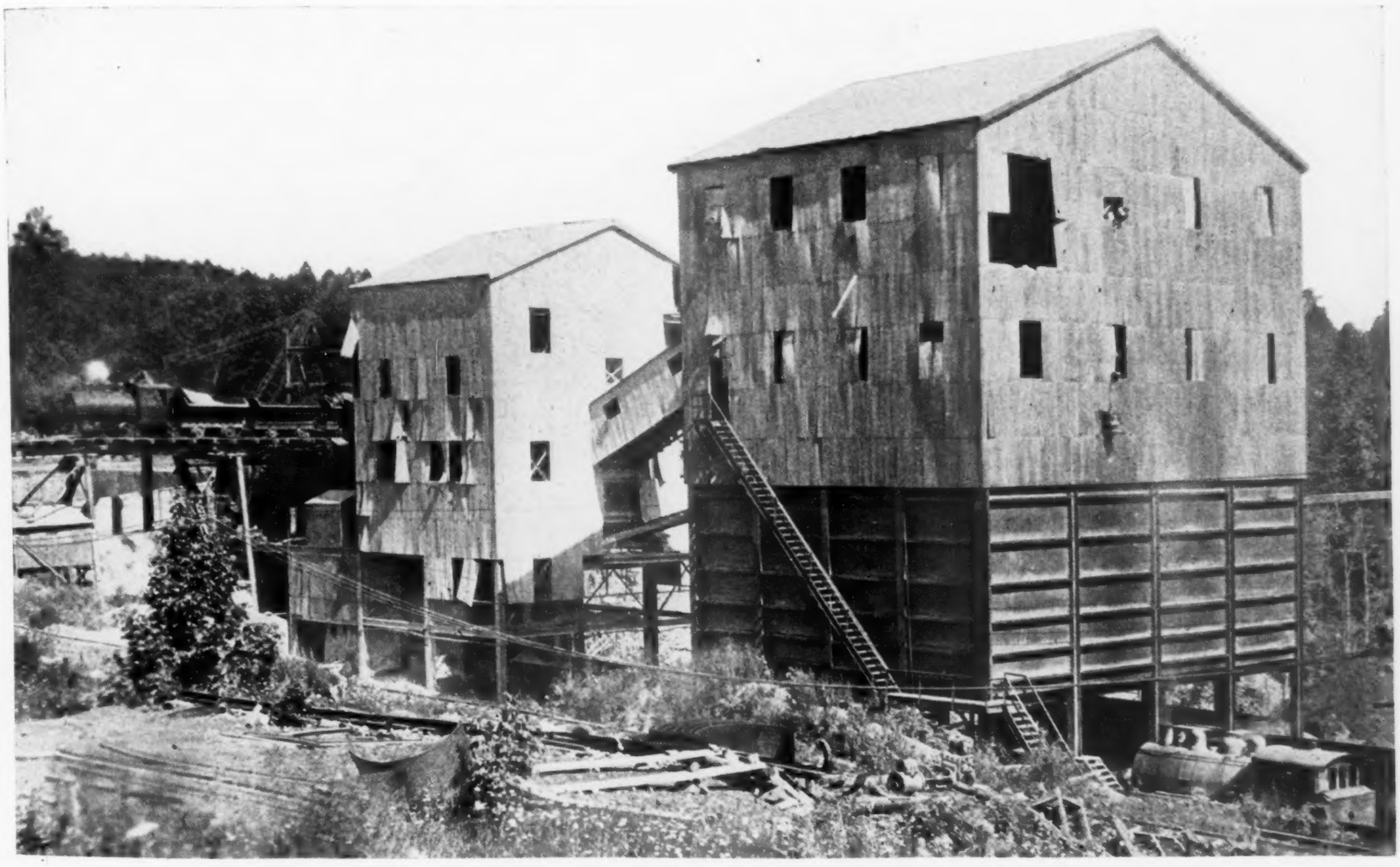
Plant of Birdsboro (Penn.) Stone Company Produces 4000 Tons Daily of Clean, Washed Stone in Ballast and Commercial Sizes

THE plant of the Birdsboro Stone Co. of Philadelphia is at Birdsboro, nine miles southeast of Reading, Penn. It is said that this is the only plant of importance in the country that washes practically its entire output of crushed stone.

The rock quarried by this company is trap, classified by the state geological bureau as a diabase. It is exceedingly hard and specimens are said to have tested as high as 50,000 lb. to the square inch in resisting crushing. In structure it appears something like a dark, fine grained granite.

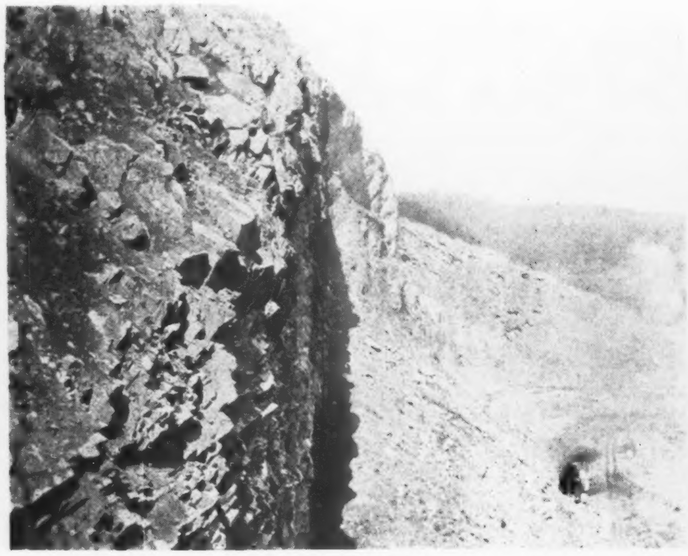
The quarry face extends across a hill for something over 1000 ft. At the highest part the face is 270 ft. high. It is worked in what is now the standard method of working large masses of rock, by putting down holes the full depth of the face and shooting them simultaneously in a "big shot." Owing to the high quarry face a large tonnage is brought down when one of these big shots is fired. The last shot fired before this article was written yielded 500,000 tons and comparatively little block holing and mud capping was needed to bring it to steam shovel size. The extensive fissuring of the rock had much to do with this.

There were eight drills working above the face the day a Rock Products representative visited this quarry. Three of these were well drills of familiar appearance, two Keystones with steam power and a Loomis clipper drill with electric power. The other five were Calyx core drills, the kind that employs chilled steel shot as a cutting medium. These drills are owned by Sprague & Henway of Scranton, who were putting down the holes on a contract basis.

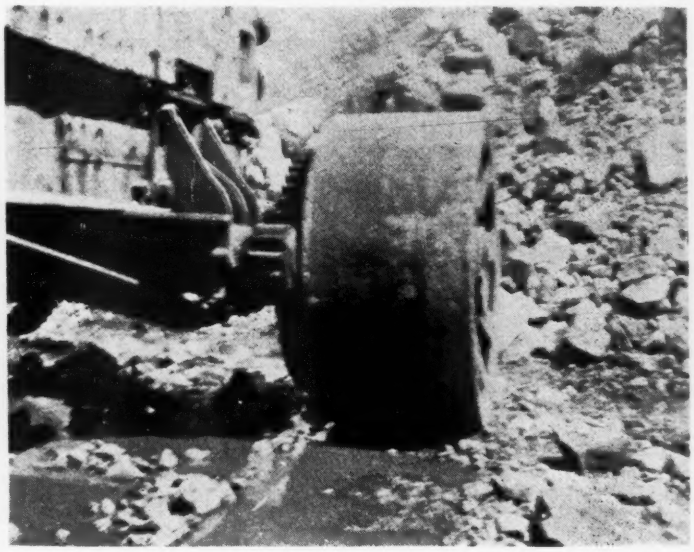


The car dump and the primary crusher are at the extreme left, the crushing plant in the left-hand building, and the washing plant in the right-hand building

From the experience so far gained with this type of drill it does not seem possible that core drills will supplant the ordinary well drill in rock of this sort. The rock is fissured and the drills stick continually, the belts flying off so frequently that sometimes

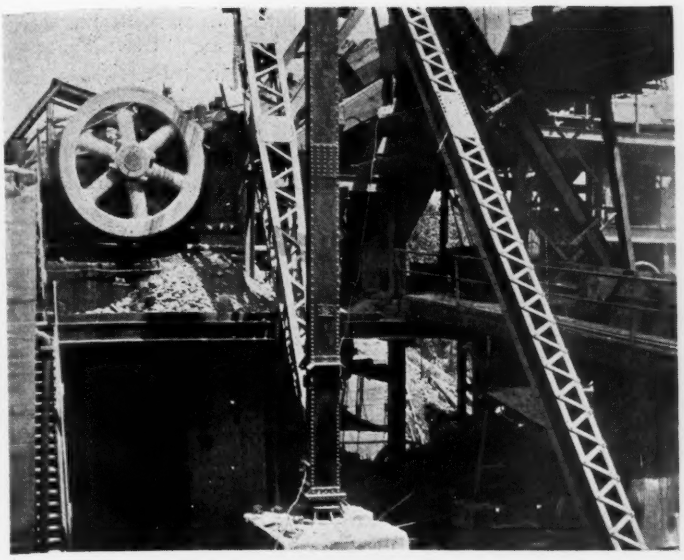


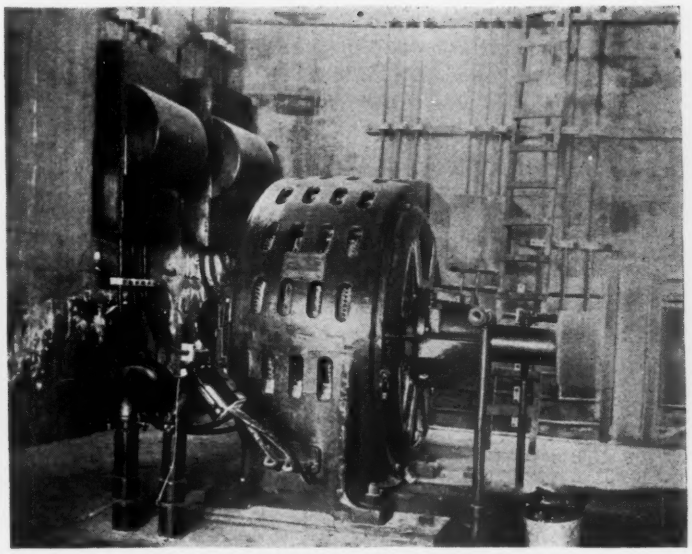

Left—Looking along the quarry face from a point near the top. Right—Well drill (in front) and five core drills on top of the quarry face

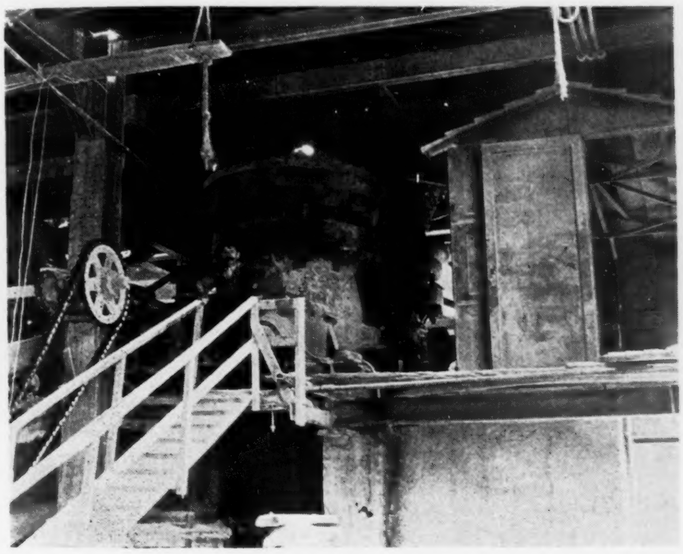
Left—A 120-ton shovel mounted on traction wheels. Note the path left by the wheels. Right—Drive mechanism on the tractor wheels of the shovel

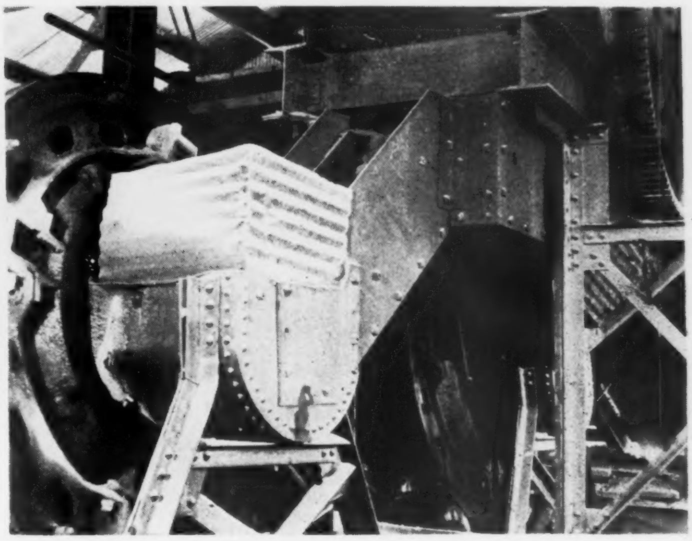

Left—Close-up of a core drill at work. Right—A 20-ton standard gage locomotive and four of the steel cars which the company builds at the plant



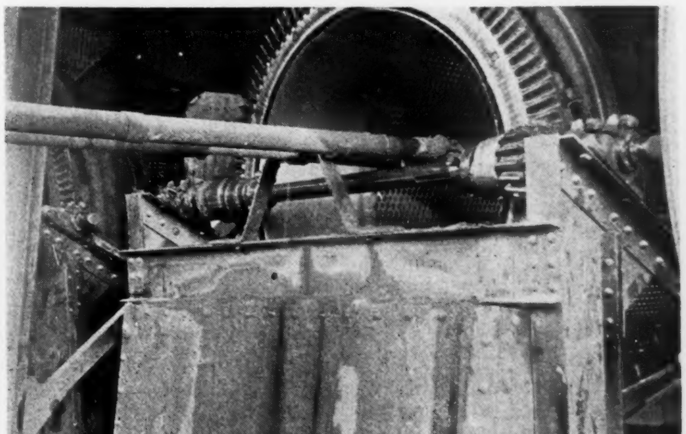


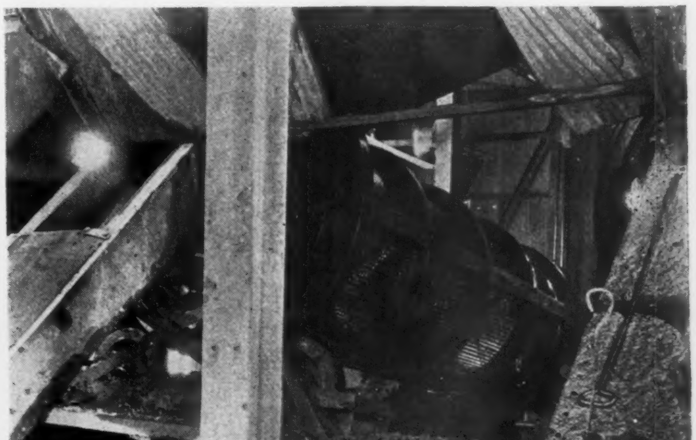
Left—Primary jaw crusher. The secondary gyratory crusher is underneath. The stiffleg derrick is for handling large stones above the crusher. Right—The 500-hp. motor, and switchboard, that drives the primary jaw crusher and secondary gyratory crusher





Left—Two of the four 16-in. gyratories. Each has a direct connected motor. One of these motors is in the house at the right. Right—Head of 36-in. conveyor and chutes to washing screens

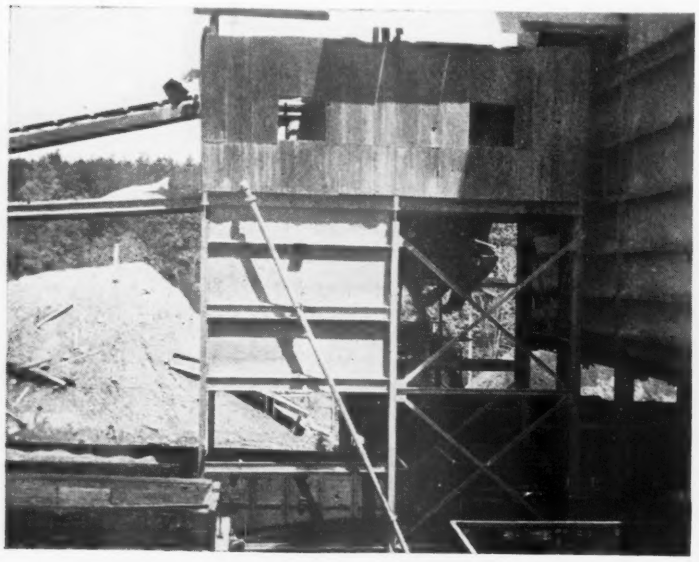




Left—Drive end of washing screen showing steel chute for oversize and the two 4-in. pipes that bring in the wash water. Right—One of the two 24-ft. by 60-in. sizing screens. Note the very heavy construction of the frame

all five drills are stopped at once. The consumption of steel shot is heavy, running about 10 lb. to the foot, and the progress is only 3 ft. to 4 ft. a day as against 5 ft. to 6 ft. made by the well drills. Jamming of cores is a frequent cause of stoppages. A new machine of much heavier construction was brought on the ground on the day the writer visited the quarry and it is possible that this may prove more effective than the lighter type, but so far nothing shows that core drilling will beat churn drilling in this particular quarry.

All holes are 8 in. in diameter and are loaded with 7-in. powder which comes in one stick, 22 in. long, to the 50-lb. case. The holes are loaded within 15 ft. of the top and then tamped with soft earth. Each hole is carried at least 5 ft. below the quarry floor and the spacing for the holes is 15x35 ft.



Left—Small screening plant between the buildings that separates the sand and "half-inch" and "quarter-inch." Right—Sand settling box (at left) and derrick and bucket by which sand is taken from the box to a drainage pile

Left—Stone storage at the plant. The main storage pile is on the railroad three miles from Birdsboro. Right—Machine and repair shop

For loading quarry cars one 120-ton Osgood and one 95-ton Bucyrus shovels are employed. These shovels may claim to be historic, as they were the first of such large size to be mounted on traction wheels. William A. Kelly, the superintendent, devised the drive and mounting and had a hard time to convince first his own company and then the makers of the shovels that the plan was feasible. Mr. Kelly preferred traction wheels to caterpillar mounting for working on a quarry floor of this hard rock, as the weight of the shovel can crush small pieces (with the small area of contact on a wheel) which the caterpillar would have to ride over. Traction wheels are now made as standard equipment on shovels of this size.

With 4½-yd. dippers these two shovels have no trouble in keeping the plant supplied with the 4000 tons it crushes daily. But of quite equal importance is the transportation system which has been very well worked out. There are five standard gage, 20-ton Porter locomotives, each of which pulls four 10-ton cars. Four locomotives can do the work, each hauling five cars, when it is necessary to use a locomotive elsewhere. The track is put down in solid, permanent fashion (except temporary stretches near the shovel) of 75 lb. rail. This keeps track maintenance down to the minimum. The quarry cars are designed and built by the company.

The track from the shovels runs in a rising spiral to a bridge over the primary crusher. This is a Worthington jaw crusher 60x84 in. The product of this crusher falls directly into a 30-in. McCully gyratory crusher, so that all the material, coarse and fine, passes these two crushers before being screened. It is then taken by an inclined belt conveyor to the scalping screens which have 3-in. round hole perforations and have a dust jacket with ⅝ round holes. These and all the other screens in the plant are of Worthington make. A comparatively small tonnage of fines is taken out by the dust jacket and falls directly into a car and is taken away to be sold for highway purposes and filling in jobs. It is the only product that is not washed. A 500 hp. General Elec-

tric motor drives the primary and secondary crusher.

The oversize of this screen goes to a battery of four 16-in. McCully gyratories, each of which is driven by a 150 hp. Ideal motor directly connected to the countershaft of the crusher. The product of these crushers falls through a chute to an elevator which returns it to the scalping screen. Thus everything is crushed to pass a 3-in. round hole before going to the washing plant.

The washing plant is about 100 ft. from the primary crushing plant and the two are connected by a 36-in. belt conveyor that takes the material from one to the other. The plant is splendidly constructed, steel being used everywhere. Even the floors and stair treads are of steel and cast iron.

The belt conveyor delivers the stone to the top of the plant, where the stream is split between two washing screens which are 60-in. diameter and 18 ft. long. Water is added at this point. The main section has 1¼-in. round holes and the jacket has 1-in. round holes. Everything that passes this jacket, including the water, goes to a small screening plant between the washing plant and the primary crusher. This has two 48-in. diameter screens 24 ft. long with ⅝-in. and 5/16-in. holes. The oversize and the sizes between these screens fall to bins and the undersize of the 5/16-in. jacket goes to the sand settling tank. This is a concrete box which is provided with an overflow. The settled sand is removed as fast as it accumulates by a stiffleg derrick with a ¾-yd. bucket. This sand is finding a growing market as fine aggregate.

The intermediate product of the washing screen goes to a bin and the oversize is sent to the main sizing screens of the plant. There are two of these, the actual screening portion being 24 ft. long and 60-in. diameter. They are very solidly built with angle iron reinforcing and like all the other screens in the plant are of the tire and trunion type. There are six sections, but only two sizes of perforations, 1½-in. and 1¾-in. The oversize, which is through 3-in. and on 1¾-in., is railroad ballast. The remaining sizes, known as "three-quarter" and "inch-and-a-half," are commercial sizes.

All the water for washing and for other purposes flows to the plant by gravity. The company has dammed a stream and built a reservoir in the hills above the plant which supplies ample water under sufficient pressure for washing sprays at all times of the year. Each washing screen has two 4-in. pipe lines running through it. In the sizing screens below no water is used.

Apparently there is no need of any more scrubbing than is given by the tumbling of the material in the washing screens, as the rock is clean and shows no film of dried mud. It is in fact rather exceptionally clean for a product that is given only a single wash.

There is a large storage pile at the plant but the company maintains its main storage yard on the railroad about three miles out of Birdsboro. A regular track system is laid down there so that the different sizes can be loaded readily by a locomotive crane. Sometimes as much as 200,000 tons are kept in storage. This looks to be more than would be needed, but one sees why when one learns that the Pennsylvania railroad often puts in a large order and asked to have it delivered at the rate of 100 cars a day. Then the Philadelphia market is a heavy consumer of crushed stone and highway materials have their peak of shipments that must be met.

Work goes on at this quarry winter and summer. In the winter time all pipes that cannot be drained are blown out by compressed air. The only trouble experienced comes from the gates on the bins freezing shut. These are quickly thawed out by bringing the smoke stack of one of the locomotives underneath the gate and turning on the blower.

The quarry face which rises 270 ft. above the steam shovel shown

A large machine and blacksmith shop is maintained for repairs and building cars and like work. Pneumatic tools may be used anywhere about the plant, as air lines are laid everywhere that such tools may be needed. Two Class E-R-1 Ingersoll-Rand Compressor furnish air for these and also for the X70 Jackhammers which are used for block holing in the quarry.

The main office of the Birdsboro Stone Co. is in Philadelphia. Charles A. Brawn is president and treasurer, Robert MacBurney, secretary and general manager, and William A. Kelly is superintendent at the quarry.

Requirements for Lime in Sand-Lime Brick

LIME for use in the manufacture of sand-lime brick must have a purity of about 85% and must have reasonably low magnesia content, according to specifications recently published by the Bureau of Standards of the Department of Commerce. It must also be reasonably fresh, as will be indicated by a low carbon dioxide content. Either quicklime or hydrated lime may be purchased, but the former must be completely hydrated before use. Methods of analysis are given in the specifications.

These specifications were prepared with the assistance of the Interdepartmental Conference of Chemical Lime, composed of representatives of the Geological Survey, the Bureau of Mines, the Bureau of Soils, Bureau of Chemistry, Forest Service, Fixed Nitrogen Laboratory and Chemical Warfare Service. They were unanimously approved by the National Lime Association.

These specifications are given in Circular No. 150 of the Bureau of Standards entitled "Recommended Specifications for Quicklime and Hydrated Lime for Use in the Manufacture of Sand-Lime Brick." Copies may be obtained from the Superintendent of Documents, Government Printing Office, Washington, D. C. The price is 5 cents cash.

Asbestos Interests Consolidate

ASBESTOS MILLS, LTD., has recently been incorporated in Quebec as a merger of a number of asbestos interests in the Province. The following companies are controlled by the new corporation: Asbestos Mines, Ltd., Black Lake Asbestos and Chrome Co., Imperial Asbestos Co. and General Asbestos Corporation. The first three own asbestos properties at Black Lake and the last at East Broughton in the Thetford mines asbestos belt in Quebec. J. A. Jacobs of Montreal is the leading figure in the merger.

The new company will control the rights to the recently developed wet process for recovering the fiber owned by the Selective Treatment Co. This company has been working for three years on the problem of recovering the fiber with a minimum breakage by virtue of wet grinding and the immediate removal of the liberated fiber from the pulp. It is claimed that a net money yield of at least double that which can be realized with the old dry process can be obtained. S. H. Dolbear, who heads the Selective Treatment Co., is now preparing plans for the construction of the first 700-ton unit of a plant at Black Lake, in which the new process will be used. O. B. Hofstrand has been engaged as consulting engineer on this construction which is to be financed by Asbestos Mills, Ltd.

G. L. Burland, consulting engineer for Asbestos Mills, Ltd., estimates that the reasonably assured ore in the Asbestos Mines property will total 2,000,000 tons, from which he figures a net profit of more than $3,000,000. The ore reserves of the Black Lake properties are considerably greater according to his estimate.—*Engineering and Mining Journal Press.*

Some Problems of the Lime Industry

Need of Research Work by Individual Business Organizations — Combining a Study of Quarry and Plant Operation for Greatest Economy and Profit

By Tyrrell B. Shertzer
Engineer-Manager, Ohio Dolomite Association, Columbus, Ohio

IN a forthcoming article, the place of the engineer in modern business will be pointed out. This article will indicate specific instances of the value of the engineer to a particular industry.

The industry to be dealt with is the *Lime Industry,* for the reason that for several years the writer was connected with it and is more familiar with the problems confronting the producers of lime. Similar conditions exist in other rock products industries, so that the following comments will, in reality, have a wider application than may be apparent at first glance.

Early Conditions in the Business

The discovery that subjecting certain kinds of rock to heat would result in a material which, with the addition of water and sand, would again become hard and hold structural units together, was made so far back that it has not even been preserved in tradition. For centuries individuals made lime, by the simplest methods, to supply their own needs. The simplicity of methods and apparatus and the fact that lime, either as such or mixed with other simple natural materials, such as pozzuolana, was the only known cement, lulled the producers into a false sense of security. Until a comparatively few years ago, the production of lime could hardly be classed as an industry in the present meaning of the word. Individuals built one or more small kilns of the simplest design for the production of enough lime to supply their own needs and that of the immediately adjacent territory, which could be supplied by wagon haul. Little was known, or cared, about the composition of the stone from which the lime was made so long as it would produce a material which would slake and subsequently harden when used as mortar or plaster, or would meet the demand for other uses.

As competitive materials began to appear, backed by the organized efforts of producers, they made slow but steady progress in the displacement of lime. The individualistic lime producers viewed these inroads with complacency until the loss of business brought them to a realization of the seriousness of the situation as regards their interests. The producers of the competitive materials recognized early, that the successful distribution of their products depended largely upon a full knowledge of their properties. They also discovered that united effort was more effective than individualism.

T. B. Shertzer

As a consequence competitive producers pooled their interests and one of their first steps was to engage technical men to study and investigate their materials and products. The net result of these far-sighted provisions was, that representatives of these interests could approach consumers with definite data and evidence as to the value and merits of their output. The lime producers had no similar ammunition with which to protect their products.

A few of the progressive and far-sighted lime producers recognized the passing of the old methods, and the peril into which the business was running, engaged technical men to find out something about their materials, but apparently without a full realization of the necessity of finding out *all* there was to be known. The next step taken was for these manufacturers to pool interests in the formation of an association for the purpose of studying and promoting the uses of lime.

The Need for Individual Investigation

The lime industry is a peculiar one in a way since, while associated effort along the lines of research and promotion are of undoubted value, the varying nature of the stone from which lime is made precludes the possibility of each of the individual manufacturers obtaining the solution of his problems through association research. Association work must of necessity be altruistic and must be along broad and general lines. To solve the problems of any individual producer would be eminently unfair to the other members who pay their proportional part of the expense involved. To solve the problems of all the members would entail very nearly as much expense as if done by each for himself and this expense would not be equitably apportioned since the larger producers would be paying for the solution of the problems of the smaller ones, in large measure.

A woman lime producer has demonstrated conclusively that research and investigation will yield profitable returns. By a careful and thorough study of her quarry she has identified numerous differences in the available raw material, by intensive study of methods of treatment best suited to each of the variations, she is able to produce truly wonderful products. By a very simple expedient, she is also able to present incontrovertible evidence in connection with certain classes of damage claims in shipments. Doubtless the increased prices obtained for her finer products and the savings in damage claim cases, have met the expenses involved many times over.

The present-day lime producer works his plant under chemical control to a degree, in that he has frequent analyses made of representative samples of the raw material and of his finished products. This proceedure insures that the consumer will get good lime suited to his purpose, but it does not, however, tell the producer whether he is putting out the best possible product or one which would demand a higher price. These analyses *are* made along standardized and more or less

conventional lines and take but a few of the possible elements or constituents of the material into account. This feature has been very ably covered in a paper by G. F. Loughlin, of the U. S. Geological Survey, entitled "A Plea for More Complete Analysis of Limestone" (Rock Products, September 10, 1921).

Chemical analysis will not tell the whole story, geological and physical studies must also be made to arrive at the true answer. As examples, let us consider limes from certain sections of the Middle West as compared with some produced in the East. Ordinary methods of chemical analysis show that the lime from these widely separated sections are practically the same, yet one is highly plastic while the other is unsuited for finishing. Again, why will putty made from certain lump limes be plastic, while hydrated limes made from them are non-plastic? Still again, why is it that of two limes showing about the same composition, by ordinary methods of chemical analysis, one will make a good commercial hydrate while the other will not?

These and many similar questions can doubtless be answered sometime, in a generic way, but ultimately each producer will have to make an intensive study of his own materials and methods in order to obtain satisfactory and consistent results.

Quarry Problems

The average producer opens up a quarry, develops a good working face and then goes ahead on the assumption that all of the exposed and workable stone is of the same composition, unless differences are forcibly brought to his attention.

The desirability of making a thorough study of the available raw material with the idea of producing the highest quality and best paying products possible, has been pointed out.

It is surprising to see how little forethought is given to the location of quarries in relation to the plants and to their operation, in many instances.

Aside from calling attention to the fact that great care and much thought should be given to the location of the quarry in relation to the plant so that the cost of transportation of the raw material may be held at a minmum, the writer will not attempt to go deeper into his subject. Quarry operation and methods have been so ably and fully discussed in these pages by experts, that it would be presumptuous to go into details.

General Plan Layout

As it costs money to handle and haul material, it *is* self-evident that handling and haulage *should* be reduced to a minimum. Manual labor also costs a great deal, especially in these days of high priced and inefficient labor.

In any manufacturing or producing operation, material should flow in one direction only, getting closer to the point of final disposition with each operation. The distances between places where the different operations are performed should be as short as possible and full advantage should be taken of adaptable mechanical means of transport, and careful study should be given to minimizing handlings.

To follow the material through many lime plants with long hauls and frequent crossing of paths, is enough to make one dizzy. It is not unusual to find that the material is loaded into and unloaded from cars, buggies or barrows, three or more times and handled manually a couple of more times. For instance, the stone is loaded into cars in the quarry for transportation to the crusher, after passing through the crusher it is loaded into cars to be taken to the kilns, the lump lime drawn from the kilns is dropped into buggies whence it is dumped on the cooling floor; after cooling it is shoveled into barrows or buggies for the packing or hydrating department, the packing of lump lime is done by hand, the filled packages, both lump lime and hydrated lime, are then rolled or trucked to the shipping point. It is not at all unusual for some of these hauls to be quite long, nor to find material following a zig-zag, self-crossing path.

Loading the stone into cars in the quarry, cannot be done away with for local conditions will dictate as to whether it is more economical to load "run of quarry" with power shovels or to break up the stone and select and load by hand. However, by a proper co-ordination of the several plant units, and the installation of mechanical means of transportation, all of the other handlings and loadings, enumerated above, can be dispensed with.

Kiln Operation

In the great majority of plants, the kilns are operated by "rule of thumb" methods in that an "experienced lime burner" is given full charge and uses his discretion as to the feeding of fuel and drawing the lime. While experience has given these men a sense by which they can fairly well judge, by observation, as to the fuel feed and complete burning of the lime, it is at best far from being the most efficient method of making these important determinations. There are so many factors entering into the problem of economical burning that visual observations cannot be reliable. Atmospheric conditions, the temperature and moisture content of the raw stone, the size of the stone, draft conditions and the calorific value of the fuel employed, are among the major items affecting economical calcination.

It is a rare thing to find kilns equipped with pyrometers, calorimeters or carbon-dioxide determination apparatus. The installation of these simple devices would, in most cases, indicate methods of operation which would save their cost in a short time.

In many plants the lime is drawn from the kilns at very high temperatures, the cooling chamber being either too small or improperly designed; this entails considerable heat loss which could be obviated. A properly designed cooling chamber at the bottom of the kiln conserves the heat carried beyond the calcining zone and makes it available, thus conserving fuel.

The type of kiln, kind of fuel, methods of firing, drawing and feeding are items which depend wholly upon local conditions and must be determined for each plant, or site.

Automatic and semi-automatic methods of firing kilns do not appear to have received the attention they should. Such methods of firing frequently result in considerable labor and fuel economies and it would seem that the subject should be given more consideration than it has.

General Plant Operation

Several items, properly belonging under this caption, have already been touched upon. While no attempt will be made to go into minute details some ideas will be advanced indicating how efficiency may be increased and economies effected. Reference has been made to mechanical equipment and more will be made in this section.

While the first cost of mechanical installations may appear high, a careful analysis will show that, in most instances, the savings in the cost of manual labor will be more than enough to cover the interest, amortization, repair and operating costs of the mechanical equipment. Mechanical equipment does not always mean power-operated equipment, frequently advantage may be taken of the force of gravity through the use of simple devices.

Allowing 6% for interest on investment and 20% for amortization, repairs and operation, every dollar saved by the displacement of manual labor will justify the installation of about $4 worth of mechanical equipment.

Let us now consider a completely mechanically-equipped lime plant. After passing the screen, or grizzly, the kiln stone can be fed to a conveyor to be taken to the kilns. A simple device causes the stone to be discharged from the conveyor into any one of a battery of kilns. By this method the stone is fed uniformly to the kilns and the wear and damage to the lining, and other parts of the kiln, due to dumping the stone in carload lots, is avoided.

After the lime is burned, it can be dropped directly from the cooling chamber to a slow moving conveyor for carriage to the hydrator crusher, or to the lump lime packing department. While on this slow moving conveyor, the lime will cool and can be sorted, similarly to the method used to pick out the slate in the coal mining industry. The conveyor will de-

liver the lime directly to the hydrator crusher or into elevated lump lime bins.

The present methods of handling lime in the hydrating department, leave little room for improvement. In the case of lump lime, however, there *is* room for improvement at most plants. Lump lime can be placed in the shipping containers by gravity from an elevated bin. The containers can be placed on a conveyor so designed as to carry them past the filling station, heading and labeling stations and finally deposit them at a point convenient for shipment. By this scheme the several operations can be centralized and should result in more efficiency and economy. In most plants today the containers are filled, headed and labelled while scattered all over the filling floor; this causes lost time in passing from container to container and the carrying of heads, tools, labels, etc. from place to place. It costs money to distribute the containers and more money to collect them after packing. Henry Ford has demonstrated conclusively that it is more economical to bring the work to the man, than to take the man to the work. The practicability of every one of these devices, with the exception of the complete lump lime idea, has been proven by actual use.

It is generally conceded that uniform production throughout the year, is the most economical. Unfortunately, with few exceptions, the demand for lime is seasonal, resulting either in a demand in excess of the plant capacity or in almost complete stagnation.

It is not economical to build a plant which will meet the peak requirements for the reason that the overhead will be out of all proportion during the slack season and will largely absorb the profits derived from peak production. There appear to be only two ways in which to solve this problem at the average lime plant. First: To run the plant at a uniform rate, based on the average demand throughout the year, and accumulate a stock during the slack season with which to meet the peak demands; second, to develop factory products of such a nature as to supply the consumers with lime in a form which can be used directly and in a finished state. Some plants are so located that there is a third possibility, namely the development of an export business to the warmer countries lying to the south of us, which business could be made to absorb the products during the local slack season.

The most serious objections to the first of these alternatives is that lime is difficult to store and its selling price will not stand much additional expense. If stored in the form of quicklime it must be placed in air and moisture proof containers. If these containers are of large size, such as tanks or silos, the original investment is high and considerable expense is involved in putting the lime into and taking it out of the containers. If the containers are the shipping packages, a great deal of storage space must be provided. Barrels occupy only about two-thirds and cylindrical containers only about 85% of the available cubical content of the space provided, so that from 15% to 33% of the total cubical content of the storehouse is wasted.

If the lime is stored as hydrated lime, it may be run into tanks, or silos in bulk, or stored in the shipping package. Hydrated lime can be stored more easily and economically than can quicklime. When stored in bulk, hydrated lime can be handled more cheaply by mechanical means than can quicklime. In any event, the storage of lime involves the provision of well-built storage space which is expensive.

Another objection to the storage of lime in large quantities is the question of price fluctuation, it has frequently happened that a stock of lime has been accumulated during an era of high production costs and had to be released to a fallen market which in some cases has not met the costs of production.

Still another objection, is the matter of railway-car supply. As a rule the peak demand for lime comes at the same time as the greatest demand for other commodities, or at the time of crop movements, so that it is often impossible to get enough cars in which to move the stored stock, not to mention current production.

The second alternative is still in the embryonic stage. There would appear to be a good field for the development of lime products such as partition blocks, plaster board, tile, etc., for the absorption of excess production during slack seasons. The preparation of such products would not entail great additional plant expenditures and the products would be of such a stable nature and in such forms that they could be more cheaply stored than could the lime itself. They could be shipped during the period of lightest car demand to distributors or to low cost, strategically located storage sheds. Their use would, in many instances, tend to equalize conditions by supplying lime in a more nearly finished form and so reduce the peak demand for the lime itself. Such new uses as may be found for lime, in the form of products, would justify plant extensions and incidentally greater output and profits.

Mining for Stone a Winter Operation

Supply and demand are not the only items affecting the seasonal operation of lime plants. Cold weather, snow and protracted spells of rain prevent the operation of quarries and affect uniform operation. Some of the large plants of the country have overcome this difficulty by mining all of the stone. Their source of supply can be operated all the year round and is in no way affected by climatic conditions. The writer has observed many plants at which it would appear possible to combine the methods of open quarrying and mining, to good advantage. At such locations, the open quarry could be worked in good weather and the mining operations followed during the winter and bad weather, the shift from one source of supply to the other could be effected easily and quickly and with no interruption to the stone supply or plant operation.

The Package Question

One of the greatest problems confronting the lime manufacturer is the question of packages for the shipment of quicklime. On account of the nature of the product, these packages must be both air and moisture proof. For years, the wooden barrel has been the most generally accepted shipping package but there are serious objections to its use. In the first place the cost of wooden barrels has advanced so much in recent years that it sometimes happens that the cost of the barrel in which the lime is shipped amounts to almost as much as the cost of producing the lime itself. In many localities the empty barrels have little or no salvage value and it does not pay to return them to the plants for refilling, so that their cost is a dead loss which falls on the consumer. Metal containers of various kinds are being used more and more, but their use also involves an additional expense to the consumer.

In some localities a happy solution of this problem has been worked out and it would appear that a wider adoption of the idea would be desirable where railroad sidings are available. The manufacturer supplies the quicklime to the distributor in bulk carload lots. The distributor transfers the lime to air- and moisture-proof containers in the form of tanks or silos from which the bulk lime is taken to supply the trade. This scheme involves but four items of expense as against eight for the package method of shipment.

PACKAGE SHIPMENT

1. Cost of package.
2. Filling of package.
3. Head up package.
4. Load in cars by hand.
5. Unload cars by hand.
6. Put into warehouse.
7. Take from warehouse.
8. Unload by hand at job.

BULK DISTRIBUTION

1. Mechanically loaded into car.
2. Unload directly into tank.
3. Take from tank by gravity.
4. Dump load on job.

From the above we see that not only the cost of the package is saved the consumer but the expense of six manual operations as well. These savings in the cost of delivery will not only pay for the necessary equipment but will allow a larger

margin of profit to both the manufacturer and distributor in the long run.

Deterioration of quicklime in carload bulk shipments can be prevented, during the time for average transit, by the simple expedient of covering the lime tightly with heavy paper after placing it in the car.

There would appear to be another solution of the package problem. This solution could, however, only be adopted by those manufacturers located within a reasonable distance of one of the larger centers of population. This consists in supplying ready-mixed mortar and plaster to jobs, either direct or through the medium of a distributor. Quicklime can be run down into putty and aged in large quantities much more cheaply than in small quantities. In a plant all of the work can be done mechanically and with a very small force of men. Tests have shown that limestone screenings make a perfectly satisfactory aggregate for both mortar and plaster, instead of sand; this will provide an outlet for the "fines," the disposition of which is quite a problem at many plants, at a good price. At the present time the individual constituents of mortar and plaster are transported from the points of production and, after several handlings, are delivered to jobs. There seems to be no good reason why a system of transporting ready-mixed mortar by rail, for moderate distances cannot be worked out to the mutual benefit of the producer and the consumer. One of the stock arguments against the use of lump lime in modern construction is that it takes so much time and space to prepare the putty. The adoption of the scheme to supply ready-mixed mortar should rehabilitate the use of lime in construction.

Manufacturers are very loath to go outside the narrow limits they have set for themselves and hesitate to adopt innovations or modifications. This attitude is perfectly proper until such time as the desirability, or necessity, of stepping over the limits has been demonstrated. There is no doubt but that this stage has been reached in the lime industry, as evidenced by the continued encroachment of competitive products. These competitive materials have certain properties and characteristics which appeal to consumers to the detriment of lime. It is up to the lime manufacturers now to produce materials, or products, which possess similar or superior characteristics and properties.

The adoption of competitive materials or alternatives for lime is due largely to clever and thorough promotional work on the part of the producers. This statement is not intended to be derogatory in any way, since proper promotional work is legitimate and desirable. It has been proven to be the most effective way in which to bring the attention of consumers, both active and potential, to the merits of a material or product. It is the natural outgrowth of modern business methods. The day when "the world will make a path to the door of the maker of the best mouse traps" has passed; now not only the mouse trap itself must be *shown* the consumer, but it must be *demonstrated* beyond reasonable doubt that the device will actually catch mice.

The disseminators of promotional data, either written or verbal, should have certain qualifications, among which may be mentioned a substantial foundation of training and experience not alone in the particular line of work he is to follow but also along related lines. He should be thorough, progressive and at the same time conservative. He should be quick to graps unusual opportunities and make the most of them along proper lines. He must avoid the temptation to make statements which cannot be substantiated by known facts or data. He should be able to accurately analyze and interpret, so as to be able to make decisions which will not have to be modified or retracted. He should be careful not to express opinions or make decisions until he is satisfied in his own mind that they are right. He should be far-sighted enough to be able to recognize that an apparent setback, or loss, may in the long run, be the better business. He should, of course, have a forceful and pleasing personality in order to be able to gain the confidence and respect of those he comes in contact with.

By way of illustrations, a few instances of promotional work, which have come to the attention of the writer, will be cited.

A few years ago a large concrete bridge was being built. An overzealous representative of a company made certain improper claims for one of his products and induced the engineer in charge to use the material in accord with his recommendations. A difficult piece of foundation was put in using the material, with the result that the concrete never set up properly. After waiting for a considerable length of time, without results, it was necessary to remove all of the concrete containing the material and this at a cost in excess of the original preparation of the site.

One of the leading consulting engineers of the country was retained on this job and observed the failure. As a consequence, this engineer formed a prejudice and has consistently refused to allow any of the material to be used in hundreds of millions of dollars' worth of work he has had under his supervision. In this instance, the material was used under wrong conditions and the forced and improper sale of the small amount of the material on this job, and the resulting failure, has blocked the use of very large amounts on other jobs where it could have been used to advantage.

A producer conducting negotiations with an engineer for the use of his material on a large job found that certain technical discussions and data were needed to consummate the deal. He was not in a position to supply these needs and called upon a technical representative of an association to which he belonged. The technical representative called upon the engineer and after learning the conditions under which the material was to be used and after studying the plans recommended against the use of the material and so reported to the producer. The producer was very much incensed at this apparent betrayal and failure to back up his sales efforts.

A few months later, the technical representative received a letter from the same engineer asking him to call. The first statement made by the engineer was to the effect "when you were here before you recommended against the use of this material and told me why, honestly. I now have a larger job and will adopt in full such recommendations as you may make." After again studying the conditions and plans, certain recommendations were made which involved the use of many times the amount of material which could have been placed on the first job. In this way a staunch friend was made for the material and the engineer in question has since been a consistent user and a good customer of the producer.

A large structure was about to be started in which any one of several competitive materials could be used. Representatives of the producers of several of these materials called upon the man in charge and advanced their arguments. He made it a point to mention a particular material to each of them and was regaled with vigorous disertations on the shortcomings of the material mentioned. He later sent for a representative of the material he had mentioned and asked him about the relative merits and demerits of the several competitive materials. When told that it was not the policy of the representative to draw direct or insidious comparisons between his and competing materials but to confine himself to a presentation of facts regarding his own material, the consumer stated that a material which was considered important enough to warrant so much vigorous discussion by competitive interests must have undoubted merit and he had decided to use it.

Many more promotional anecdotes could be cited from the writer's experience. The three given are presented with the idea of illustrating some of the cardinal points of promotional work.

1—Know your own material and its limitations thoroughly.

2—Know the relationship between your material and others with which it may be used.

3—Know the conditions under which your material should and should not be used.

4—Be absolutely frank and honest in all your dealings.

5—Avoid drawing derogatory or insidious comparisons between your material and competitive materials.

Dredge unloading at the screening and washing plant on the lake front at Superior, Wis.

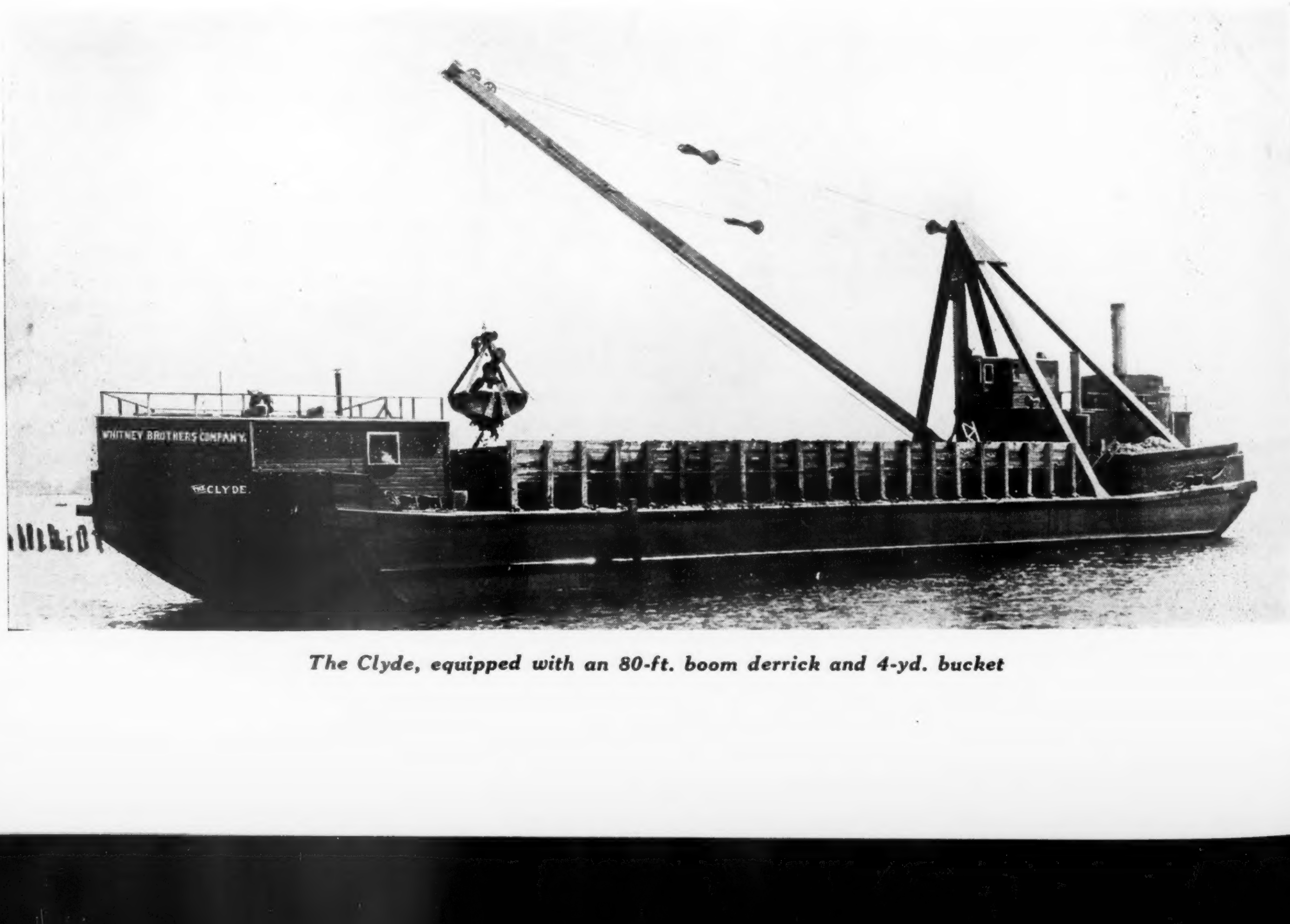
Tows Sand and Gravel 120 Miles to Market

The Whitney Brothers Co. of Duluth, Minn., Has Built Up a Large Sand and Gravel Business Under Unusual Conditions

By Franklin A. Alter
Of Rock Products Staff

FOUR derrick barges dig sand and gravel and tugs haul it 120 miles to where it is washed and screened for the market. It would seem that such an operation could not be profitable, but the Whitney Brothers Co. of Duluth, Minn., is not only doing this, but it is also successfully competing with other operators and has built up what is probably the largest sand and gravel business north of St. Paul, by such an operation.

Good sand and gravel is somewhat scarce in the vicinity of Duluth. Practically all of it that is used in concrete construction in the vicinities of Duluth, Superior and Ashland, and Port Arthur, Ontario, all of which are ports on Lake Superior, is secured from underwater deposits near the shores of Lake Superior and is dug and transported to the several distributing points by means of powerful lake towing tugs and steel derrick barges. At present the company is operating at a point about 120 miles away. This is a very unusual length for water transportation, the closest parallel to it in the writer's knowledge being at Charlestown, W. Va., to which material is brought about 60 miles from the Ohio River, although there are several hauls of 40 to 50 miles on the Mississippi. There is gravel available closer to the Whitney Brothers' plant, but it is not of the quality that the company's trade demands. They, therefore, bought the property where they are now operating so that they could supply their cus-



The Clyde, equipped with an 80-ft. boom derrick and 4-yd. bucket

tomers with material that would meet the most exacting specifications.

The possibility of making a commercial success of an operation conducted under such unusual conditions lies in the fact that Whitney Brothers are specialists in marine transportation and in tug and barge design. Naturally when they were called upon to construct their own equipment they were in a position to do it cheaper and better than the average sand and gravel producer could. They also had the experience necessary to design equipment adapted to the unusual working conditions.

Buckets Instead of Centrifugal Pumps

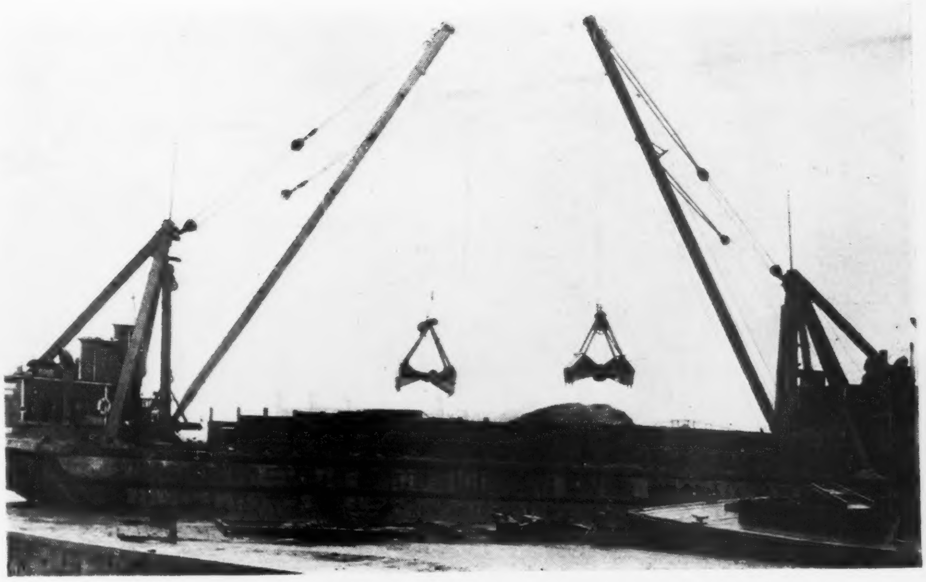
The design that was adopted for the company's dredges was one that has stood the test of experience in the northern part of the Great Lakes, although it is unfamiliar to those who are acquainted with only the river dredges of the country. The centrifugal pump, so much used for digging sand and gravel, is replaced by boom derricks with clamshell buckets. A cargo box is added to the hull so that it can transport as well as dig the gravel. Living quarters for the crew have had to be included, as the dredge works so far from the homes of the men. And finally the construction of the hull had to be especially strong to resist the rigors of a northern climate and to enable the boat to "buck" the ice in entering a harbor in cold weather.

Description of the Dredges

The largest of these four dredges is the "Limit" of 1750 tons cargo capacity. It is equipped with two stiffleg derricks, one at each end of the hull. The booms of these derricks are 18-in. square timbers, 80 ft. long, and each derrick is equipped with a 4-yd. Williams bucket. The hoisting engines on this dredge are 3-drum units built by the National Iron Works. Like all the other dredges the Limit has its own boiler and auxiliary equipment, the boiler being of the marine fire box type operating at 150 lb. pressure. The hull is of composite construction, having a steel frame and deck, with wooden sides and bottom. It is equipped with comfortable living quarters for the crew of eight men. Auxiliary equipment includes a centrifugal pump and boiler feed, sanitary, deck and bilge pumps. The dredge is also equipped with a Fisher electric generator for supplying lights.

The Clyde is a 1200-ton cargo capacity dredge of the same construction as the Limit equipped with one 80-ft. stiffleg derrick and a 4-yd. Williams bucket. The hoisting engine is a 12x14-in. triple drum Clyde, made by the Clyde Iron Works, of Duluth. It is equipped with a Pylo National electric generator and lighting unit.

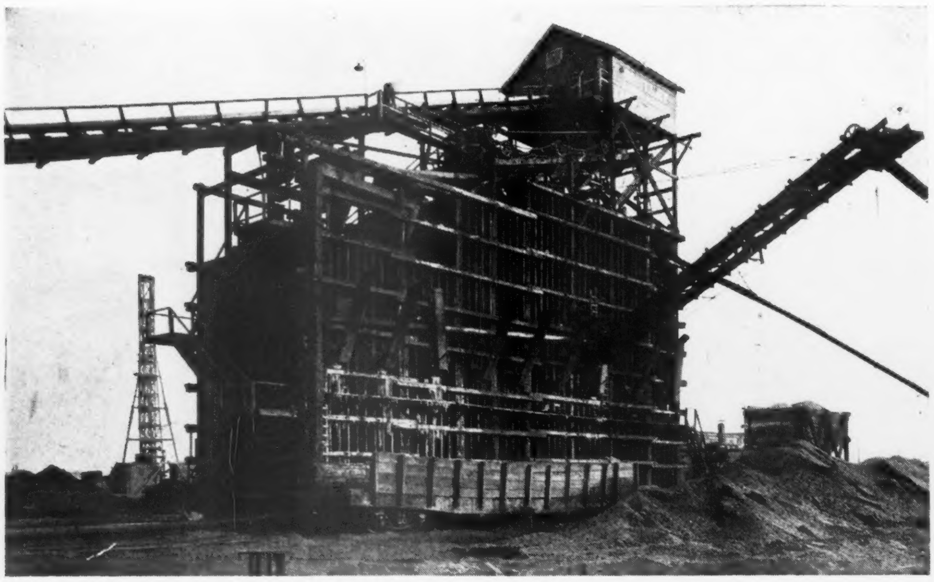
The other dredges known as Scow No. 4



The double-derrick dredge "Limit," the largest of the dredge fleet. The cargo box holds 1750 tons

All-steel tug "William A. Whitney," wireless equipped. This has a special automatic towline and is built to break ice as well as to tow

All-year operation in the northern part of the Great Lakes becomes strenuous at times



Left—The main screening and washing plant; right—main conveyor, 185-ft. centers, from crushers to screening plant

and Scow No. 6, are of somewhat less capacity.

Whitney Brothers Built Entire Fleet

The entire fleet was designed and built at the shops of Whitney Brothers Co., with their own construction forces and all heavy repair and maintenance work is done at the same place. Each dredge, however, is completely equipped for making its own ordinary repairs without coming to the plant. This equipment includes a complete machine shop, with drill presses, lathe, air compressors with pneumatic tools, blacksmith shop, etc.

The dredges dig to a depth of 30 to 40 ft. and their average loading time is approximately 400 yd. per hour. The living quarters on each dredge will accommodate seven or eight men, and include mess room, bunks and other facilities. These same dredges are also used for lightering stranded vessels and general emergency work.

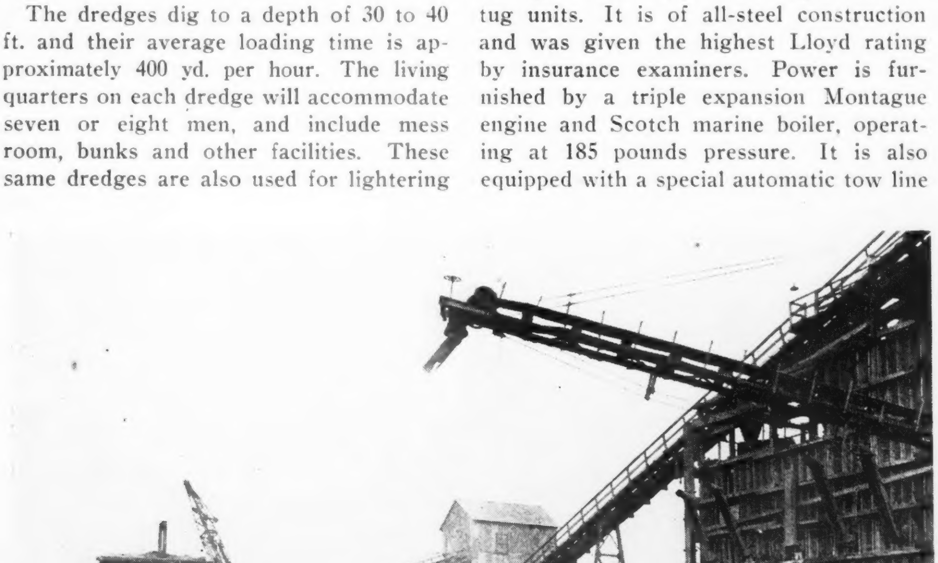
The Tugs

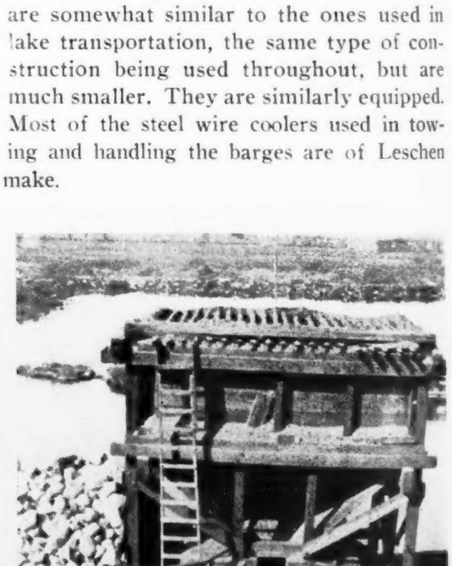
The tugs, of which there are four, are of the company's own design and were built at the same plant. They are fully equipped in every detail for long distance towing and for ice breaking, as the fleet usually operates until long after the regular close of navigation each year. The tugs are equipped with quarters for nine men, including galley and sleeping accommodations.

The tug William A. Whitney, used for towing the Limit, is the largest of the tug units. It is of all-steel construction and was given the highest Lloyd rating by insurance examiners. Power is furnished by a triple expansion Montague engine and Scotch marine boiler, operating at 185 pounds pressure. It is also equipped with a special automatic tow line driven by a 10x10-in. American engine. Living accommodations are provided for 10 men, and a completely equipped wireless room is an especial feature. The other tugs are all of wood construction and have crews of nine men. Each tug is complete as to auxiliary equipment.

Auxiliary Transportation Equipment

In addition to the dredges described above, the company operates several smaller derrick barges for transporting material from the screening plant to their various distributing yards and for delivering directly to dock construction work and other work on the lake shore. These are somewhat similar to the ones used in lake transportation, the same type of construction being used throughout, but are much smaller. They are similarly equipped. Most of the steel wire coolers used in towing and handling the barges are of Leschen make.





Left—Another view of screening plant showing unloading hopper at left and crushing plant in the center. Note boom conveyor in foreground; right—hopper and 90-ft. conveyor from hopper to crushers

One of the retail distributing yards

The Screening and Washing Plant

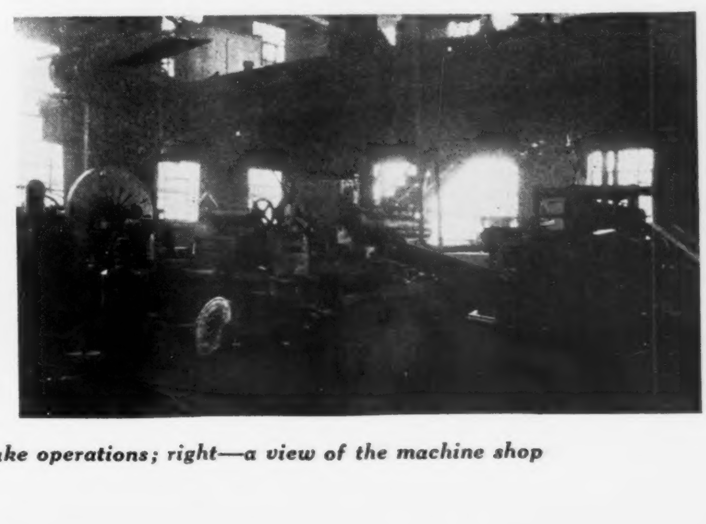
The screening plant, to which the material is towed, is located in Superior on the lake front, and on a branch railroad which connects with the Soo, Great Northern, Northern Pacific, Duluth, Winnipeg and Pacific, Duluth and Iron Range, and Duluth and Messabi railroads. Thus the company is admirably equipped for both water and rail delivery. The barges discharge a part of their cargo into a 100-ton wooden hopper and the rest into piles near the hopper. A 25-ton Industrial locomotive type crane with a 55-ft. boom feeds the hopper from the storage piles. The hopper feeds directly on to a 30-in. conveyor belt, with 90-ft. centers. It is driven by a 20-hp. Westinghouse motor. This and all other conveyor and elevator units are of Link-Belt make. The belt discharges into a 48x120-in. Link-Belt scalper screen, with 2-in. openings, driven by a 7.5-hp. Allis-Chalmers motor. Oversize from the scalper screen passes into a No. 6 Worthington gyratory crusher which is rated to crush 30 tons per hour from 6-in. down to ¾-in. It is driven by a 40-hp. Westinghouse motor. If desired the material may receive primary crushing in a 20x10-in. Blake type jaw crusher driven by a 20-hp. motor before going to the No. 6.

The material from the No. 6 crusher passes over a Link-Belt caterpillar feeder and is raised by a 42-ft. elevator, with 8x16-in. buckets, driven by a 10-hp. Ideal motor to the scalper screen where it is rescreened. The undersize of the scalper (everything under 2 in.) is conveyed to the main screening plant by a 30-in. conveyor belt with 185-ft. centers, fitted with a Goodrich belt. The material next passes through a battery of six screens arranged in two rows of three. The first screen in the row has a 1-in. mesh screen cloth. Everything from 1-in. to 2-in. discharges directly into a bin. Everything under 1-in. passes through into the next screen which has ¼-in. mesh wire cloth. The sand drops through into two conical Link-Belt 72-in. separators.

Double Washing

The oversize from the second screen in the system, which includes clean gravel from ¼- to 1-in., is now passed over another ¼-in. screen where water is added and the material is rewashed. It finally

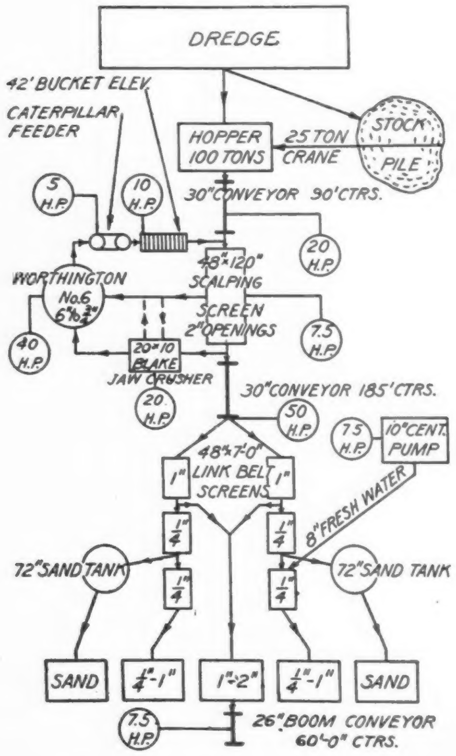
Whitney Brothers Co.'s offices at Superior, Wis.



Left—Scow No. 4, another of the dredges for lake operations; right—a view of the machine shop

drops into a bin. All of these six screens are 48x84 in. and are of Link-Belt make. A 50-hp. Allis-Chalmers motor drives these screens, and the conveyor feeding them, through Link-Belt sprockets and chains.

There are six bins of 2000-yd. combined capacity. Various sized products may be easily made by changing screen sections. For loading from the bins into cars a 60-ft. boom conveyor is used, with 26-in. belt, shown in one of the plant pictures.



Flow sheet of the washing and screening plant

This pivots so that it can load the material from any bin, either into car or stock piles. On the other side of the plant spouts are arranged for loading into trucks. The locomotive crane mentioned before also serves for loading from the stock piles.

The Washing Equipment

Water for washing purposes is furnished by a 1500-g.p.m. American Well Works pump driven by a 75-hp. Westinghouse motor. This pump is located in the crusher house. The suction pipe is 10 in. and the discharge is 8 in. in diameter. Altogether about 1500 ft. of American spiral pipe is used in connection with the pump. This entire washing plant is of the latest Link-Belt design. Power, which is purchased from the Minnesota Power and Light Co., comes in at 13,000 volts, 3 phase, 25 cycles, and is stepped down to 440 volts for the motors and 110 volts for the lights. The plant is lighted, as it is worked continuously in two shifts of 10 hours each. Only four men are necessary in each shift.

In addition to the home plant two retail distributing yards are owned by the company. One is located in the west end of Duluth and the other near the east end. They are served from the home plant by scows, and each plant is equipped with stiffleg derricks, hopper, and other auxiliary equipment necessary for economical handling of materials.

Complete Machine and Repair Shop

Whitney Brothers operate a modern and complete machine and blacksmith shop in connection with their various operations. The equipment includes a 10-ton overhead crane, steam hammers, punches, shears, lathes, forges, planers, milling machines, keyseaters, drills, etc. It is practically a manufacturing plant, as a considerable portion of the company's equipment is made right here. This is especially true of some of the clamshell buckets and stiffleg derricks.

The present officers of the company are Gwin A. Whitney, president; E. H. Whitnew, vice-president, and E. A. Banister, secretary and treasurer. The main office is at Duluth.

Feeding Minerals to Live Stock on the Farm

ORDINARY farm rations furnish most of the large number of minerals needed by live stock and any mineral supplements that are fed need only contain those minerals which are known to be lacking in farm feeds, according to a new circular, "The Feeding of Mineral Supplements to Live Stock," which has just come off the press at the college of agriculture, University of Illinois, and is now ready for free distribution to interested persons. The new publication answers many of the questions that have been brought up through the widespread use of mineral mixtures by farmers in growing and fattening live stock. It was written by H. H. Mitchell, associate chief in animal nutrition at the college.

The minerals in which farm rations may be deficient are calcium, phosphorus, sodium, chlorine and iodine, according to the circular, which adds that there is no evidence that farm rations ever are deficient in nay other minerals beside these. The need for iodine seems to be limited to certain localities and to pregnant females, or young growing animals, and its general use in mineral mixtures is neither necessary nor advisable.

Calcium may be provided in (1) high-grade limestone, preferably limestone containing only small amounts of magnesium; (2) bone meal or spent bone black, but preferably in steamed bone meal; (3) wood ashes; (4) rock phosphate or acid phosphate, and (5) slaked lime. Phosphorus may be provided in bone meal, in rock phosphate, acid phosphate or steamed bone meal, the latter being preferable, while sodium and chlorine can be obtained readily and cheaply in common salt. Iodine may be provided as potassium or sodium iodine, the latter being the cheaper source, according to the circular.

Laxatives, worm remedies or other drugs, as well as coal, charcoal, sulphur, peat and other fillers do no good in mineral mixtures compounded for general use, the publication adds.

The new circular gives complete directions for making up simple mineral mixtures and also outlines recommendations for the use of mineral supplements. It may be obtained free by writing the College of Agriculture, Urbana, Ill.

Asbestos Companies Active in Idaho

ACCORDING to reports from Idaho Falls, home of Dr. H. H. Scarborough, secretary of the company, the Idaho-Montana Asbestos Co. has begun to produce and is ready to start shipping steadily. The asbestos deposits being worked by this company are near West Yellowstone. The heavy equipment necessary to treat asbestos has been installed and put in operation. The company plans to construct a power line shortly to reduce operation costs. The power will be generated on the Madison river.

Although the asbestos mine in the Yellowstine Park country is attracting considerable attention, it is not the only asbestos mine in Idaho. Up in the northern part of the state the Panhandle Asbestos Co. is opening up a promising property in the vicinity of Kamiah. This company recently shipped several tons of fibre to an eastern machinery house for experiments preliminary to the selection of machinery. The asbestos of this company is reported to be of good quality and it is expected that machinery will be installed soon enough to begin production by October 1.

Estimating Portland Cement in Concrete Samples

BULLETIN 61 of the Engineering Experiment station, Ames, Iowa, gives two methods of analyzing concrete samples (such as might be obtained from a state highway) to find the portland cement content. In brief it consists of disintegrating the sample by heating, brushing off the coarse aggregate and analyzing the sand cement mixture for silica and calcium oxide content. The silica content of the cement being known, at least approximately, the cement may be figured either from a silica basis or a calcium oxide basis. Several examples are given to show the correctness of the method.

Mining and Quarrying Compared by an Engineer Familiar with Both Operations

Part 6—Typical Limestone Mining Operations in Central Pennsylvania

By J. R. Thoenen, Member A. I. M. E.

HEREWITH are descriptions of two typical limestone mining operations in Central Pennsylvania. These constitute a continuation of the series of articles on limestone mining operations in the August 9 and September 6 issues of ROCK PRODUCTS.

Plant D—Working a Thin Stratum for Concrete Aggregate

In the preceding descriptions we have considered operations working on moderately thick seams. Plant D on the other hand is operating on what might be termed a stratum of medium thickness; or for a low priced commodity such as limestone it might be termed thin.

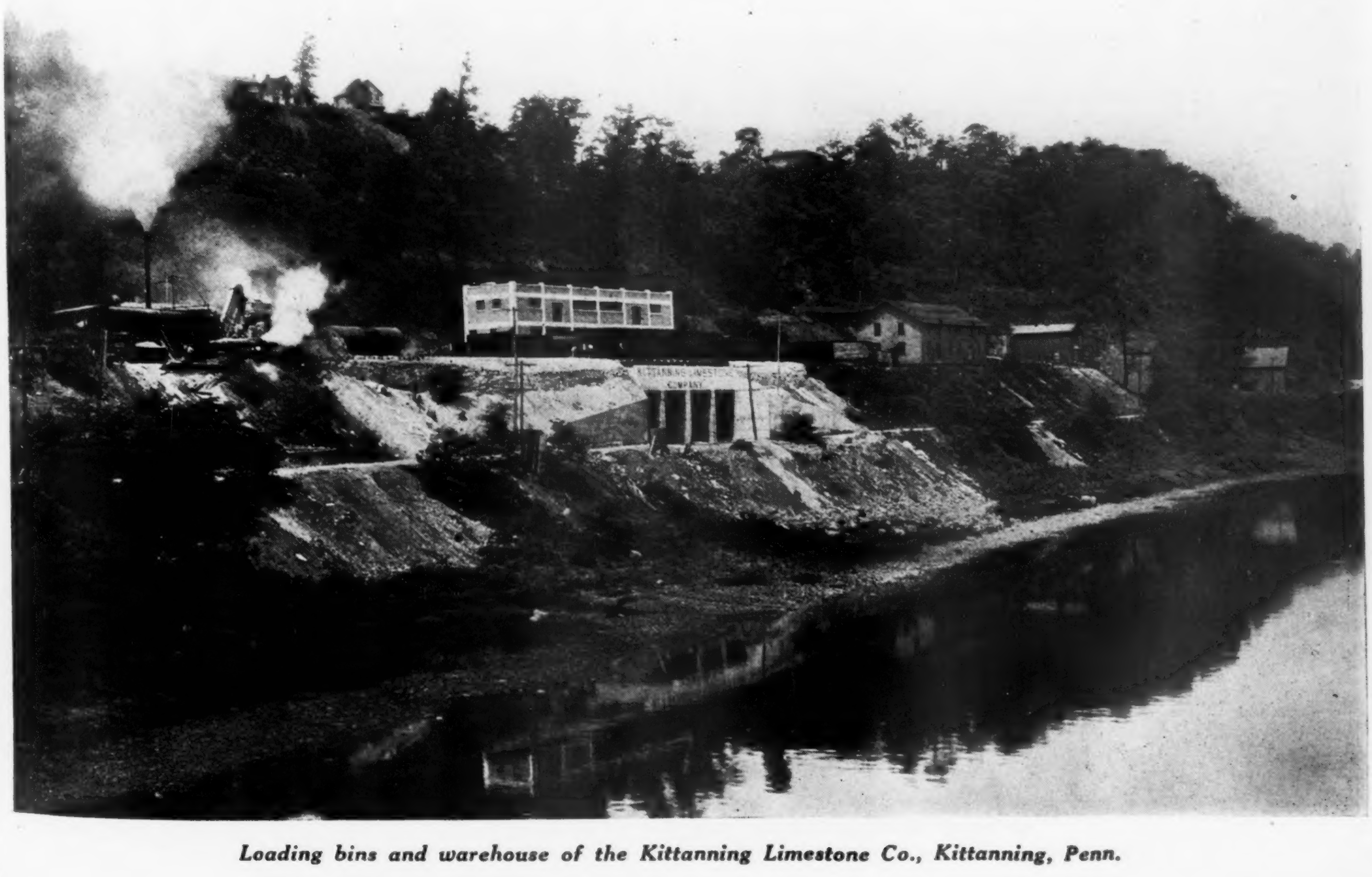
This plant produces stone used almost entirely as a concrete aggregate. Therefore possibly not quite so close a check on grade is necessary and size is of minor consideration as far as actual mining operations are concerned.

The stone mined consists of a 12-ft. stratum of limestone of medium hardness dipping about 50 ft. per mile with a not very clean parting on the bottom. Two feet of this stone is left on the back to carry the shale above. This leaves only 10 ft. of mineable stone.

An interesting feature of this particular plant is that 40 ft. above the limestone mining operation is an active coal mine. Both operations proceed without injury to either one.

The method of mining used is the room and pillar system with a main haulageway driven up the slope of the stratum and rooms turned off at right angles. Irregular rib pillars are used, their size depending on the condition of the back. Rooms are carried 30 ft. wide.

The method of breaking the ground differs from the usual tunnel round of mining practice (see sketch). The center or V-cut is used to start a heading. This is then followed by the same sort of cuts but with one row of holes acting as rib holes. In other words, triangular blocks of ground are broken at each blast. As in the usual V-cut the holes in these supplementary cuts are drilled to meet at the bottom. There are three holes in each vertical row or six holes to each triangular block blasted. Holes are drilled from 8 to 12 ft. deep as the ground will allow. All drilling being done on contract, the method of placing holes is left to a great extent to the individual miners.



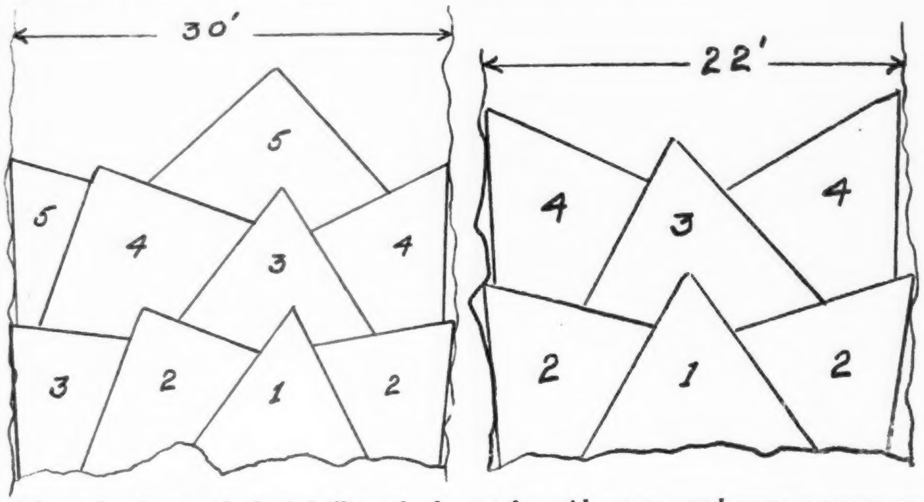
Loading bins and warehouse of the Kittanning Limestone Co., Kittanning, Penn.

Small air hammer drills are used mounted on tripods; ⅞-in. hollow hexagon steel is used with four point machine sharpened bits. Water under pressure is forced through the steel to remove cuttings and to keep down the dust. Blasting is done with fuse and caps and 35% gelatin dynamite is used.

Loads are gathered by mules and hauled to the crushing plant by three-ton gasoline locomotives.

By this system a pound of explosive produces between ½ and 1 ton of rock.

Approximately one ton of rock is produced per foot of hole drilled.



Plans showing method of drilling the breast for wide rooms and narrow rooms as described in Plant D showing triangular blocks of ground broken out at each blast

Cars are at the present time loaded by hand on contract, but mechanical shovels are contemplated.

Each man underground produces 18 tons in nine hours.

The crushing plant is a side hill location so arranged that elevators are unnecessary and the flow of rock is a gravity feed throughout.

Based on 100% for total cost per ton of stone costs are as follows:

Stripping	0.0%
Explosives	16.7%
Labor	41.2%
Supplies	13.3%
Power	5.5%
Depreciation	8.9%
General Expense	14.4%
	100.0%

Plant E—Operated on Contract System

Plant E also is a thin seam mine, the limestone stratum reaching a maximum thickness of 9 ft. One foot below the top of this stone is a remarkably smooth parting which is utilized as a roof. The floor parting is equally as smooth. In fact the writer has never seen as smooth a back and floor covering any great area in any other mine. No wooden ties are necessary for track laid in rooms. Metal spacers only are used and the track laid on the clean floor without any ballast whatever. The stone lies flat with little dip. As noted previously the upper foot of good stone is left to carry softer formations above; hence only 8 ft. is available for mining.

Mine tipple and crushing plant of the Kittanning Limestone Co.

Mining a 12-ft. stratum of limestone for crushed rock

The method of mining is room and pillar using round pillars. Main headings are carried 24 ft. wide and driven on 350 ft. centers. Rooms are driven at right angles to main headings and are carried 32 to 35 ft. wide with 30-ft. pillars between.

The method of drilling and blasting ground is the same as Plant D and will not be discussed further here, except that each vertical row is composed of two holes rather than the three of Plant D.

Small air hammer type drills are used mounted on tripods developed at this mine. The drill is used without the usual carriage and is mounted on the horizontal leg of the tripod by a movable carriage actuated by a rope and counterweight so that the drill bit is at all times kept pressed against the bottom of the hole automatically. (See cut.) Hollow hexagon 1⅛-in. steel is used with bull bits.

Blasting is done with 35, 40 and 50% gelatin dynamite with clay tamping.

Cars are loaded by hand, gathered by mules, and hauled by gasoline locomotives.

All drilling and loading is done on contract or piecework.

From ½ to 1 ton of rock is broken per pound of explosive.

Each foot of drilling produces 1 ton of rock.

Ten tons of rock are produced per man underground per day.

Based on 100% for total cost per ton of rock costs are as follows:

Stripping	0.0%
Explosives	15.0%
Labor	37.4%
Supplies	12.2%
Fuel	4.0%
Depreciation	7.7%
General Expense	23.7%
	100.0%

(To be continued)

[The succeeding number in Mr. Thoenen's series will describe mining stone to supply a large cement plant, a thoroughly systematized underground operation.—Ed.]

Sand for Use in Plaster

THE shrinkage of cementitious materials would be a serious drawback were it not so easily overcome by the addition of sand. If the proportion of sand is so regulated that when the plaster is in position the sand grains are in contact with each other, the interstices between them being filled with cementitious material, there can be no shrinkage. If more sand is used, the voids will not be filled with cementitious material, and the plaster will be lacking in strength. If less sand is used, the grains of sand will not be in contact with each other, and the plaster will shrink. It is safer to use a little too much rather than not enough sand, for a slight sacrifice of strength will not make much difference, whereas shrinkage will cause cracks which are immediately noticeable.

A fine sand, or one containing too much fine material, will have a large number of small voids. It has been found very difficult to get these voids filled with cementitious material, so that a sand of this kind will make a weak plaster and should not be used. If the sand is all coarse, the voids will be so large that the cementitious materials will shrink away from the grains of sand.

Sand is the chief constituent of plaster. Because of its comparatively low cost and wide distribution, not much attention has been paid to its quality.

It is generally accepted that sand shall all pass a No. 3 sieve; anything coarser than this is gravel or crushed stone. It is likewise coming to be accepted that all sand shall be retained on a No. 100 sieve; anything finer than this is clay, loam, or silt.

Natural sands are usually grains of quartz, but sand is not necessarily siliceous. Ground rocks of almost any kind make good plastering sands if they are properly screened. The rock should not contain noticeable amounts of pyrites or similar iron-bearing minerals which might stain the plaster. Common salt and other substances which are quite soluble are apt to cause trouble. They may combine with some of the other ingredients to form deliquescent materials which will prevent the plaster from drying out; or they may leach through to the surface and crystallize there as the water evaporates, producing efflorescence.

The idea that the sand grains should be angular instead of round is expressed in many of our building codes. While there is a possibility that the points of the grains may permit better attachment of the cementitious material, the fact remains that a satisfactory plaster can be made with round-grained sand.

Sand should meet the requirements given in the current specifications for gypsum plastering sand, issued by the American Society for Testing Materials, No. C35, except that the requirement that 80% of the sand shall be retained on a No. 50 sieve shall be regarded as an ideal to be approached rather than a rule to be enforced. While this specification is designed for sand for use with gypsum, the same kind of sand is satisfactory for use with other materials. *—Circular of Bureau of Standards, No. 161.*

Shipments of Gypsum in Canada

THE total shipments of gypsum from Canadian deposits during 1923 amounted to 578,301 tons, valued at $2,243,100, as compared with 559,265 tons worth $2,160,898 in the previous year. The average values of grades received by operators were as follows: Lump, $1.81; crushed, $1.90; fine ground, $6.14, and calcined, $11.28 per ton. The output of gypsum rock totaled 558,853 tons, of which quantity 152,036 tons, or 27%, were calcined. Shipments of gypsum in 1923 were:

SHIPMENTS BY GRADES

	Tons	Value
Lump	217,414	$ 394,217
Crushed	232,899	443,431
Fine ground	7,452	45,719
Calcined	120,536	1,359,733
Total	578,301	$2,243,100

SHIPMENTS BY PROVINCES

	Tons	Value
Nova Scotia	341,705	$ 747,934
New Brunswick	104,740	564,680
Ontario	99,958	542,317
Manitoba	31,575	386,554
British Columbia	323	1,615
Total	578,301	$2,243,100

A Handsome French Catalog of a Cement Company

ONE of the best catalogs of a cement manufacturing company that has come to the desk of ROCK PRODUCTS is that of Poliet & Chausson, 125 to 129 Quai Valmy, Paris, France. This company has a capital of 25,000,000 francs and operates 23 plants in various parts of France, besides 24 French *maisons de vente* and one in Belgium. These plants make not only portland and white cements but slag cements, hydraulic limes and prepared plasters. A description is given of the manufacture of these products and also of their physical and chemical characteristics with analyses.

Modern Methods and Processes of Mining and Refining Gypsum*

Part IV—Calcining

By Alva Warren Tyler

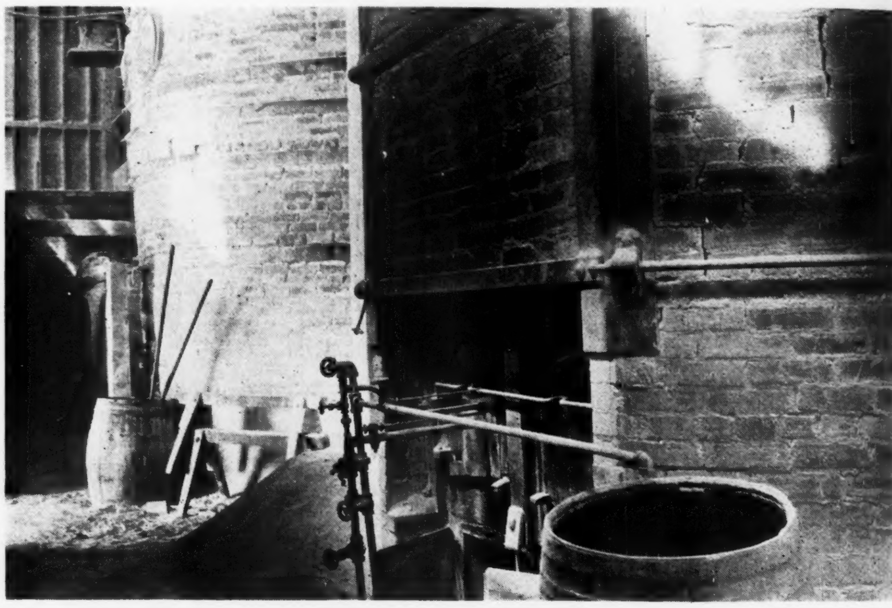
THE technical name for gypsum is "hydrous calcium sulphate," the chemical formula for which is $CaSO_4 + 2H_2O$, the two molecules of water being in chemical combination with the sulphate and known as the "water of crystallization."

Calcination is merely the process of heating the raw gypsum to a point where *a part* of this water of crystallization is driven off. A properly calcined gypsum in a pure state would correspond to the formula $CaSO_4 + \frac{1}{2}H_2O$, or in other words 75% of the water of crystallization would have been driven off. If all the water of crystallization were to be driven off, a "dead burned" product would result, making it useless for ordinary plastering purposes, or for the manufacture of the regular line of gypsum products, such as plaster or wall board, partition tile and roof tile, due to the fact that it will not again — when water is added—take up its water of crystallization and "set" in its original state, as it does when properly calcined. It is therefore necessary that an accurate check be kept on the temperature of the material as it is being calcined so that only the proper amount of moisture is removed.

A number of methods have been devised for this calcination process but those successfully and commercially used in the United States have been confined to two, known as the "kettle or batch process" and the "continuous process." The kettle process, which is the only one of these two requiring the use of a dryer as previously described, has been used since the beginning of the industry in this country where production has been carried out to any commercial extent. A prerequisite when using this process is that the product be finely ground before delivery to the kettles and in general it may be said that the finer the grind the more freely and economically does the material calcine.

The calcining kettle, which at best is a very crude machine for calcination, figured from the viewpoint of efficiency, is very effective for producing a uniform stucco and has been greatly improved in the last few years. Formerly, small sized machines, 6 to 8 ft. in diameter, were used, but those soon proved to be entirely too inefficient and of too small capacity for large production. Machines 12 to 14 ft. in diameter and 12 ft. high have been developed, but most large manufacturers have standardized on a machine 10 ft. in diameter and from 8 to 12 ft. in height. The diameter has been generally limited to 10 ft. for the reason that kettle bottoms greater in diameter have proved very expensive to build and unsatisfactory in performance, due to the great weight of plaster which they must sustain under the intense heat of the furnace beneath. Also the power requirements increase rapidly with increase of diameter, necessitating excessively heavy and expensive equipment required for continually stirring the material during calcination.

Fig. 8 shows the general design of a mod-



Oil-burner kettle installation

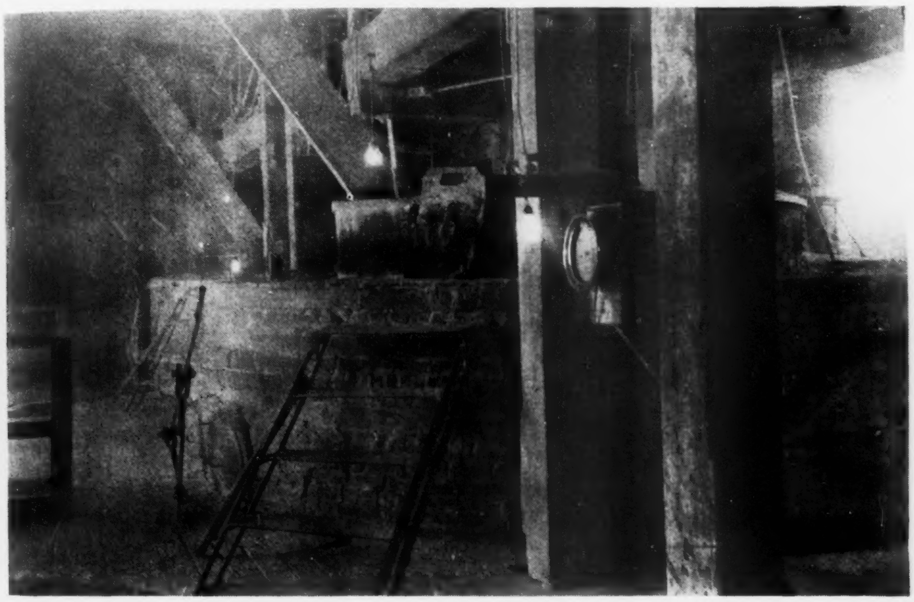
A battery of six 10-ft. by 10-ft. calcining kettles in a large gypsum plant. Much improvement has been made since these were installed

ern 10 ft. calcining kettle in its setting. The vertical shaft and sweeps required for stirring are not shown.

Fig. 9 is an outline drawing showing this unit with its self-contained driving mechanism. This design eliminates all overhead gears and drives, leaving a clear headroom above in which may be located a trolley beam hoist by means of which the kettle top and driving mechanism may be quickly removed as a unit, giving immediate access to the flues and bottoms when these are in need of removal or repair. A machine of this type will calcine a batch averaging 14 tons of rock gypsum in from 60 to 80 minutes, at a fuel consumption of from 90 to 100 lb., of a very ordinary grade of mine-run bituminous coal, per ton of plaster.

In operation, the kettle furnace is started and the kettle brought up to calcining temperature. Ground gypsum is then slowly fed to the machine and is kept continually agitated by means of a sweep running close to the bottom and mounted on the end of a vertical shaft kept rotating by means of the driving mechanism above. This sweep moves at from 15 to 24 revolutions per minute. Agitation is necessary for the proper distribution of heat through the body of gypsum. If this stirring action were to cease, or should it be insufficient, the poor heat conductivity of the plaster would allow a rapid temperature rise on the bottom of the kettle and a burned product would quickly result. When the filling operation is started, the bottom of the kettle must be sufficiently hot to very quickly start the "boiling action" of the plaster. This "boiling action" gives it the exact appearance of a kettle of boiling water and is caused, of course, by the liberation and conversion to steam of the water of crystallization in the material. The kettle must be kept in this freely "boiling" condition throughout the filling period and until calcination is complete, otherwise a premature "settling" of the gypsum will take place. When this happens a "stuck" kettle results as it is impossible to pull the sweep through a kettle of gypsum which has once settled through cooling, due to too rapid filling or insufficient heat application. Nor is it possible to relieve this difficulty by opening the discharge gate for, while the hot gypsum when in a boiling condition will flow as freely as water, when once "settled" it will not flow at all.

In order to save a "stuck" kettle from destruction from the intense heat of the furnace on the bottom and shell, the fire must be quickly pulled, or the burners turned off in case oil or gas is used. The body of plaster immediately starts to cool—which introduces another difficulty—a considerable volume of moisture, previously released throughout the mass, quickly starts a recrystallization of the partially calcined gypsum resulting in more or less of a solid cemented body of plaster. In fact, we get an action somewhat similar to that produced when water is added to plaster of Paris—only of course there is not sufficient water retained and condensed in the kettle to make the reaction complete. Re-crystallization takes place to the extent, however, that it is necessary for workmen to enter the kettle with picks and shovels in order to remove its contents. The kettle, of course, lies idle until sufficiently cool for men to work inside. An experienced calciner is necessarily familiar with these conditions and sees to it that the contents of the kettle are kept boiling at all times.



Gypsum kettle showing recording thermometer installation

Two qualities of calcined gypsum are produced by the kettle process, known as "first settle" and "second settle" plaster. This classification originated from the fact that when a certain percentage of the water of crystallization is driven off, the violent "boiling action" suddenly ceases and the kettle of plaster smooths off and "settles." The settling at this stage is not comparable with that just described, due to the fact that now most of the water has been removed. The expert calciner is very familiar with this action as it gives him quite accurate information that the proper amount of moisture has been removed and that the kettle is ready to be dumped in case he is calcining "first settle" material. If, however, the kettle is not dumped at this stage but instead continued heat is applied, the temperature rises and the mass of gypsum will again start "boiling" violently until a second smoothing and "settling" occurs. The kettle must be dumped at the "second settle" as otherwise an overcalcined or "burned" product will result.

The "first settle" plaster which is calcined at a lower temperature is that which is almost universally used for the various plasters now on the market. "Second settle" material is only produced for special work where a plaster of higher density is required, as "second settle" material is slower setting and gives a harder, denser product.

A temperature chart shown in Fig. 10 indicates very clearly the temperature conditions over a period of 24 hours in the regular run of "first settle" material. The ammeter record illustrated in Fig. 11 will indicate the relative power required during the various stages of calcination on a gypsite kettle 10 ft. in diameter and 10 ft. high, carrying approximately 14 tons of material. The sudden increase in power at the settling point clearly shows how very heavy and "dead" the material becomes as soon as the moisture has been driven off. By further reference to the chart it will be noted that during the first boiling or calcining period the temperature holds steadily at 250 deg. but rises rapidly just

Coal-fired gypsum kettle installation

before the "first settle" which occurs at 330 deg. If "second settle" stucco were required, it would be seen that the thermometer would hold around 350 deg. during this second boiling period, which indicates that a much greater heat is required to drive off the last 25% of contained water than that required for the first 75%.

Both oil and coal are used as fuel, oil of course being the ideal fuel from the veiwpoint of automatic handling for cheap and convenient operation. In the Eastern districts, however, coal is used almost entirely, due to the fact that in the past at least, it has been cheaper than oil, although in the last few years, the price of coal has reached a point where it is a question whether there would be much, if any, saving. In kettle operation, it is necessary to have a very high rapid heat during the process of calcination, and that this heat be almost entirely removed at the completion of the calcination of a batch of material and during the dumping period. The reduction of heat at this point is necessary for two reasons: first, to prevent the overcalcination of the material and second, to protect the kettle itself as the plaster is being removed. Kettle bottoms have been destroyed in a very short time due to carelessness in not properly reducing the temperature at this period.

From the kettles, the finished material is discharged into what is known as a "hot pit." This is usually a large concrete or steel pit or bin below the kettles and serves merely as a receptacle for receiving the hot plaster discharged therefrom and allowing the calciner to quickly discharge one batch and immediately start filling his kettles for another. Hot "stucco," as the material is known to the industry, after calcination, is not allowed to stand in the hot pits any longer than necessary, it being immediately removed by means of conveyors and elevators and carried to the warehouse bins, or regrind bins, in case this process is desirable or necessary.

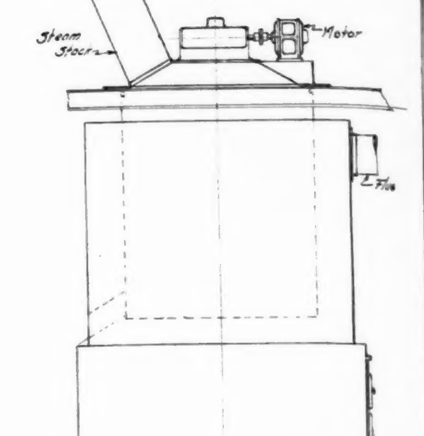
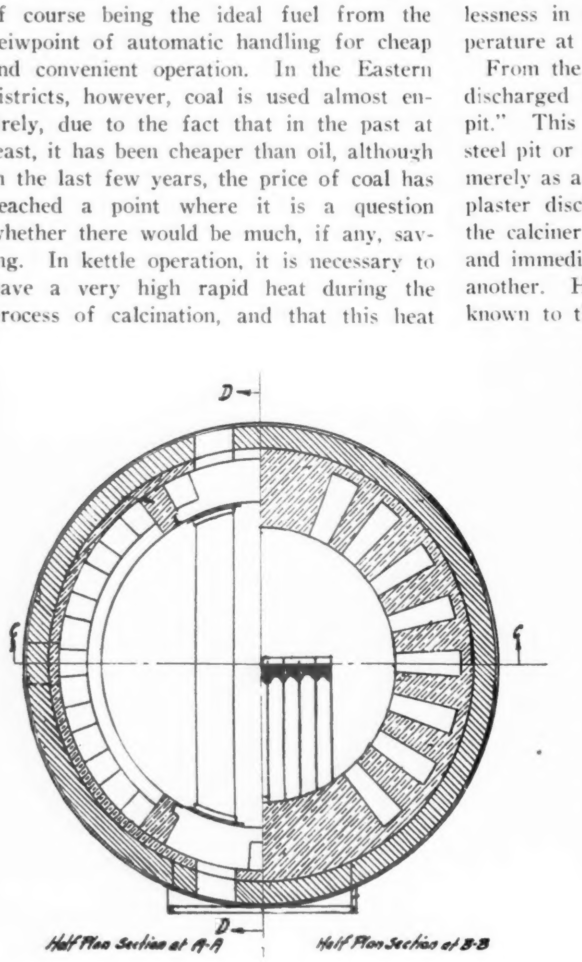


Fig. 9—Outline of calcining kettle showing the self-contained driving mechanism

Regrinding

In the earlier days when millstones were more often used than at present, and when air separation was not generally resorted to, a sufficiently fine product was seldom obtained from the initial grinders. Following calcination, therefore, it was quite customary to "regrind" the material. This regrinding process was accomplished by millstones, the same as the initial grinding, except for the fact that the regrinders were much more carefully dressed and more closely set when in operation. Their capacity was consequently much reduced, but with proper screening arrangements they were not required to handle the total volume of plaster produced in the mill.

When roller mills with air-separation systems or air separating systems operated in connection with millstones or other grinding processes, came into general use, regrinding was almost entirely eliminated, and while there are many mills still using the regrinding process, the more modern ones have discontinued its use. The more finely ground material delivered to the kettles has resulted in greatly improving the efficiency of these machines, the time required for cal-



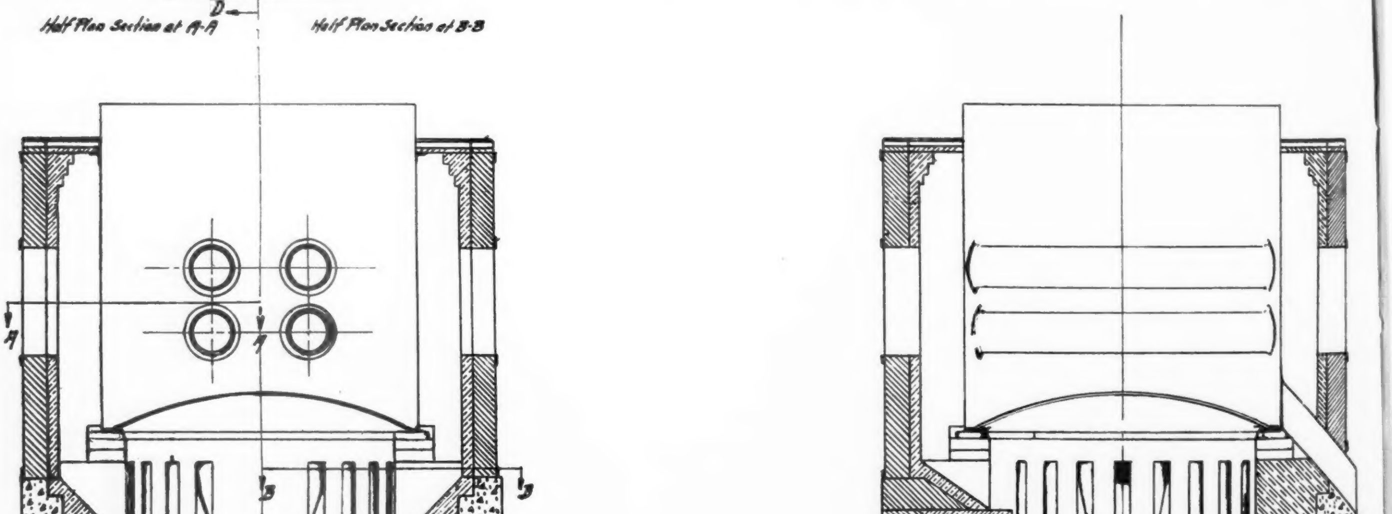


Fig. 8—Setting for 10x10-ft. calcining kettle

cination not only being appreciably reduced, but the wear and tear being reduced to almost a negligible quantity.

Grinding in Air-Tight Mills to Increase Plasticity

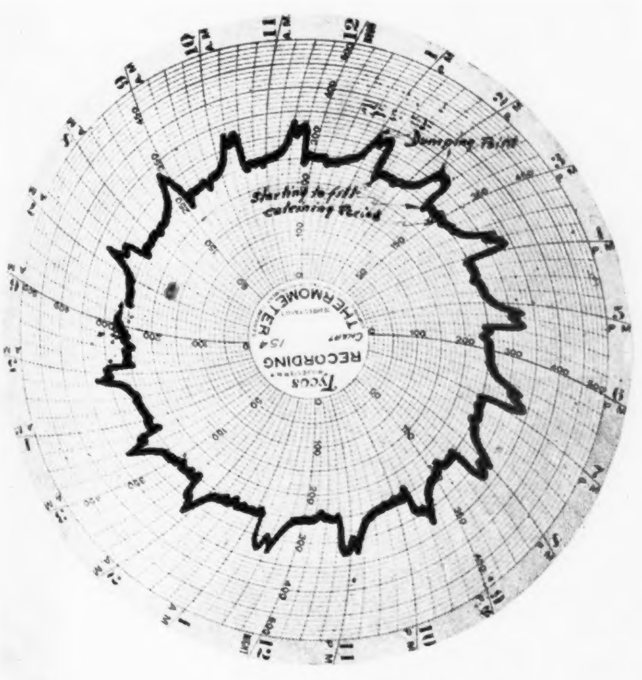
Within the past few years, the theory has been advanced that regrinding in an air-tight mill results in greatly increasing the plasticity of the material and, as a matter of fact, this is quite true. To obtain this condition, tube mills have been installed for regrinding purposes. A much more bulky plaster is produced, but up to the present time the sand and water carrying capacity the high temperature at which it is discharged from the kettles, will cause an over-calcined condition in the interior of the material, which will be productive of complaints later on, on account of short working conditions thus produced.

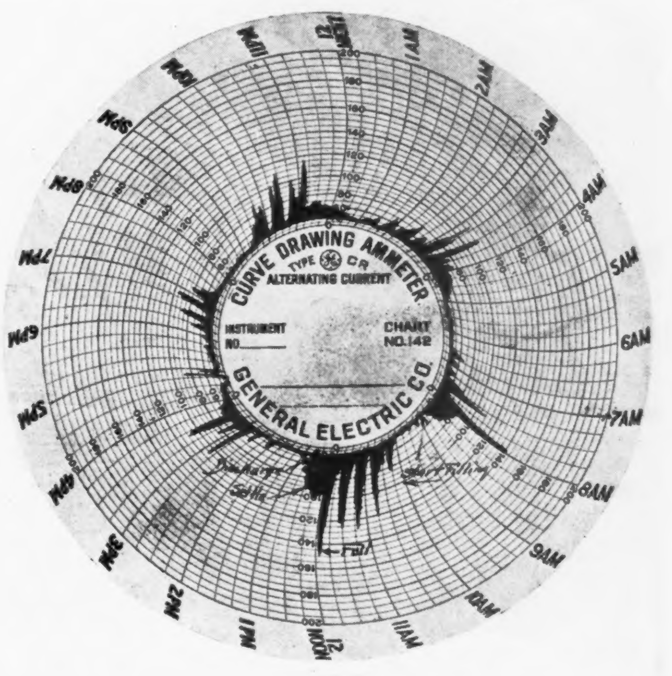
(Continuous calcining, warehousing, and mixture will be discussed in the next article.)

Steam Shovels Conserve Power

WHEN Ed Timmons shoveled 1200 lb. of zinc ore into a mine car in one minute forty-nine and a half seconds to win the recent contest at Butte, he beat without unusual effort.

Not so many years ago holes were drilled with hand steel, beaten with hammers, swung by human arms. Now, thanks to the manufacturers of air drills, "single-jacking" and "double-jacking" are virtually lost arts. Possibly some hand shoveling will always be done, but certainly the day is almost here when all big masses of broken rock will be moved by machines. Human energy is too valuable to be spent at the heart-breaking toil that was the usual lot of 20 years ago. It is not that workers are getting "soft." It is merely common-sense conservation of





Left—Fig. 10. Chart from recording thermometer installed on a calcining kettle. Note the temperature rise after the dumping point due to heat from bottom and sides after plaster is discharged, and the sudden drop as soon as filling again starts. The batches come off with remarkable regularity. Right—Fig. 11. Current consumption of individual kettle motor showing relative power required for the calcination cycle. (Taken from a gypsite kettle)

of the plaster has shown no appreciable increase over the product finely ground before calcination. Of course no practical device has yet been evolved which gives an air tight grinding condition. If this problem can be successfully solved, there may be some advantage in this regrind.

In any case, the hot stucco from the hot pits must be taken care of and if the systems of conveyors and elevators between hot pit and bins is of sufficient length to properly cool the material, it is safe to discharge it either to warehouse or regrind bins as the case may be. Otherwise it is advisable to cool the stucco by some positive method.

Rotary type coolers have been empoyed having an inclosed water circulating system and allowing the hot plaster to flow through the machine in a constant stream, the time of progress being of sufficient length as to cool the plaster below the danger point as it is well known that the hot stucco, delivered in large quantities to a warehouse bin at

57 expert ore shovelers and established a new record. Timmons is a slim man past middle age and of only medium height; his remarkable performance was accomplished by the clock-like precision of his movement, by his economy of motion. He seemed to work without great effort. It is not too much to say that he closely approached human perfection in this kind of task.

By alternating short periods of work with longer periods of rest, or by diminishing his pace to an eighth, he would be able to load about 18 tons of ore in an ordinary shift. Suppose—if we may suppose the impossible—that he were to work an eight-hour shift at the maximum rate of which he showed himself capable; he would have moved 145 tons!

And here comes the moral. The same man with a comparatively simple machine of wood and steel and brass, engined with electricity or compressed air, could load several times the amount in the same time human nerve and muscle.—*Engineering and Mining Journal-Press.*

Looking After Income Tax in Rock Products Industries

J. H. BRIGGS, chief of the non-metals valuation section of the income tax unit, has been making a tour of the Northwest and middle-Western states consulting with plant owners and managers as to income tax returns. He told ROCK PRODUCTS that he found matters throughout the rock products industry generally satisfactory. The owners and managers of plants seemed to have a full understanding of what was necessary to make a return and what was proper in the way of allowances. A part of the reason for this gratifying situation may be traced to the education given by the papers and the discussions of the Crushed Stone and Sand and Gravel associations, reprinted in the March 8 issue of this paper.

Hints and Helps for Superintendents

Preventing a Shaking Screen from Blinding

ROLLERS are often used with rotating screens to prevent the holes from blinding and descriptions have been published in this paper of how they are applied. But with a shaking screen there is a difficulty in using rollers in this way, as they are not in contact with the screen at all parts of the stroke.

The picture shows an arrangement which is working very well at a re-screening plant for gravel, at the yard of the Inland Rivers Wharf Co., Pittsburgh, Penn. It was designed by Rowland Jones, the manager of the yard.

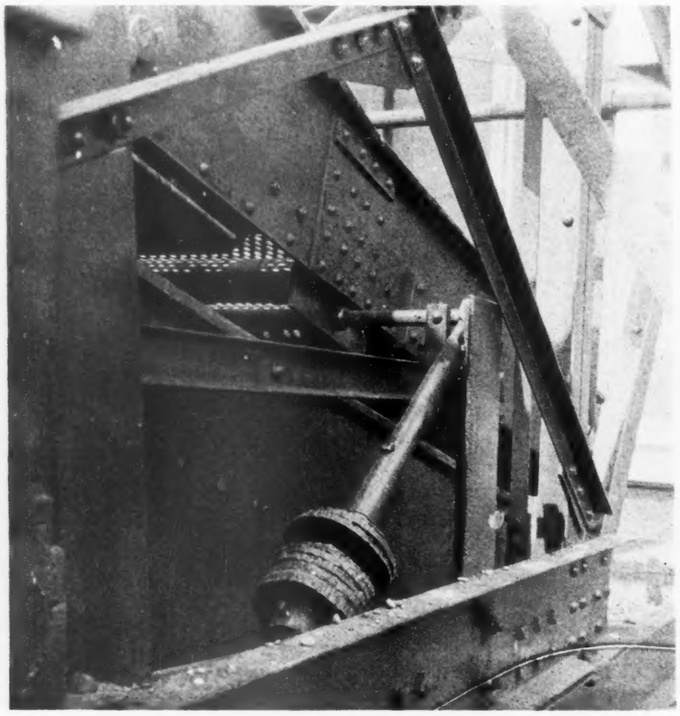
The screen is about 9 ft. long and has a steel frame supporting a plate punched with ¾-in. round holes. The motion is of the "grasshopper" variety; that is, it consists of a forward and upward motion by which the gravel is lifted and moved forward at the same time.

The screen as originally installed gave trouble from blinding as there were a great many pebbles in the gravel of just the right size to stick in the holes. Cleaning out these pebbles was a tedious job as they were pounded in pretty tightly by the weight of the gravel and the action of the screen. After some experimenting with brushes and the like Mr. Jones put on the device shown.

Four wooden rollers were made and iron pins driven into the ends as axles. The ends of these pins were carried in a yoke made of a thick steel plate. This yoke was attached to one arm of a lever fastened below the screen frame. Weights were placed on the other arm. These weights held the rollers on the under side of the screen. There is a yoke and lever and weights at both ends of the rollers.

When the screen is running the rollers are moved up and down by the vertical motion of the screen, being kept in contact with it by the weights. The screen rolls on the rollers with the forward and back motion.

It is to be noted that this device is applied at the proper side of the screen; that is, the under side. Putting rolls on top might stop the blinding by forcing through any pebbles that were slightly larger than the perforations, but this would greatly increase the wear on the screen. This device does not wear the screen at all and it may be applied to wire cloth as well as punched plate.



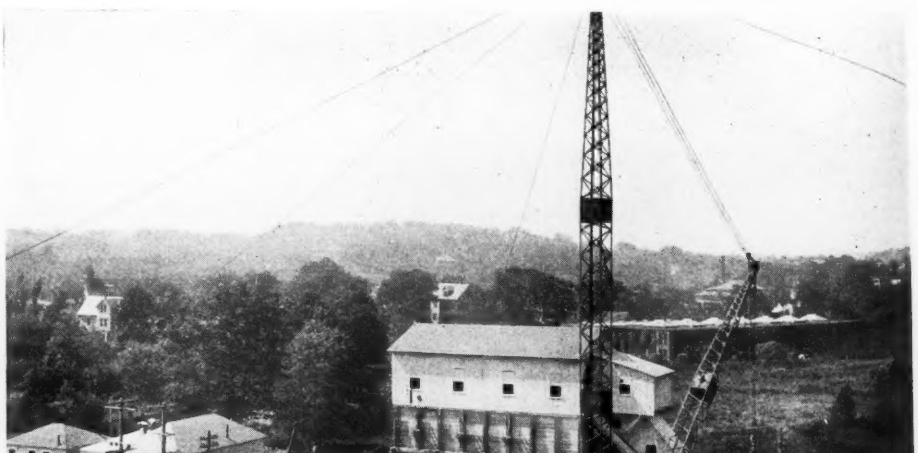
The screen has an up-and-down as well as a to-and-fro motion. The weight on the end of the arm rises and falls with the motion of the screen and keeps the rollers in contact with the screen at all times

Locks Up Bin to Prevent Theft of Crushed Stone

IT isn't often that a quarryman is obliged to lock up his stored crushed stone, but it was necessary in one case, anyway. W. H. Connor of the Boston Trap Rock Co., Hyde Park, Mass., found that enterprising individuals were helping themselves—at night of course—to the various sizes of stone that suited their fancy. Mr. Connor is an unselfish man but he thought that was going a bit too far.

To stop this theft he built wooden drop curtains on each side of his bins so that at night they could be lowered and locked. These are shown in the accompanying picture.

At the same time, Mr. Connor has provided a satisfactory garage for home of his trucks.



The picture shows the wooden curtains raised. At night they are pulled down so that trucks cannot drive under and be loaded with stolen stone

Don't Use Neatsfoot Oil on Belts!

By W. F. SCHAPHORST, M. E.
Newark, N. J.

HERE is a statement that I found in a recent well known engineering publication regarding the treatment of belts: "Apply a little neatsfoot or castor oil to tone up the belt. Castor oil is expensive but it preserves the belt, and does not collect in lumps as some belt dressings do. The oil makes the belt pliable and causes it to adhere closely to the pulleys and prevents slip."

Every once in a while the writer sees an article in trade papers recommending the use of neatsfoot oil on belts just as quoted above, and as a result many users of belts now believe that neatsfoot oil is a good dressing, especially for leather belts.

In the same way, castor oil is often recommended but I have written about castor oil before, hence will not mention it again because it really is unmentionable. I only wish to point out here that neatsfoot oil, which is animal substance, should not be used because it will decay after a while and will do more harm than good.

Any user of leather belting can make a test for himself by applying neatsfoot oil to a short piece of belting, applying enough oil so that it will penetrate into the belt. The belt will soon be found to be unusually flabby and soft and it will be found to stretch easily. If that were all, it would not be so bad, but the worst feature is that presently a rotting process will begin and the leather fibres will be harmed. As a result the life of the belt will be materially shortened

Instead of using neatsfoot oil, castor oil, boiled linseed oil, soap, tallow and other similar harmful substances, the writer would recommend the use of a high grade dressing made especially for belting —dressings that do not contain any harmful ingredients. A good dressing will contain ingredients that are preservatives and that add to the life of the belts rather than subtract from them.

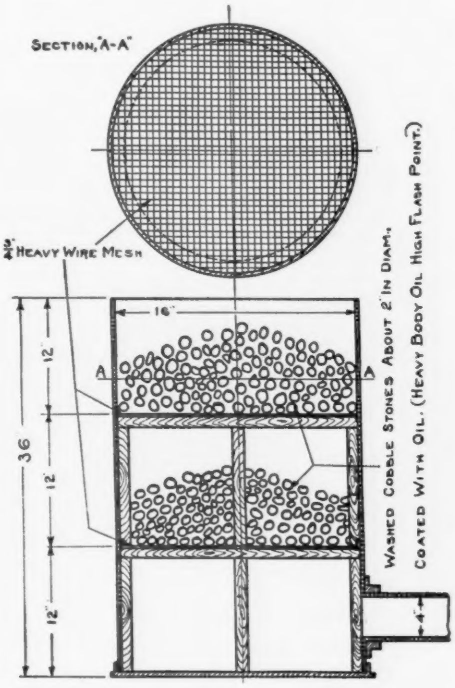
The above is not alone the result of my own personal experience and observations, but is to be found in the statement issued by one of America's foremost chemical companies.

Cleaning the Compressor Intake Air of Dust and Dirt

IN many industries today it is impossible to locate a compressor intake so that clean air can be taken into the machine without some form of air cleaner or filter being connected with the intake piping. Wherever dust or foreign matter is continually sucked into a machine, this causes rapid wear and forms a coating on cylinders, valves, etc., and where these conditions exist an air cleaner must be used.

A form of air cleaner which can easily be made at any plant consists of a metal tank in which several layers of washed cobble stones are set, these stones being laid on heavy wire mesh partition plates. The stones are coated with a heavy body high flash point oil, the dust in the air passing same adhering to the oil. Such a cleaner can have the stones removed periodically and cleaned. A cleaner of this description is shown in the accompanying cut.

The air discharge pipe should be full size



Air passes freely through the layers of coarse gravel stones coated with oil but dust and dirt carried by the air will adhere to the oil coating

of discharge opening on air cylinder. This pipe should drain to the air receiver and have no pockets formed therein. The distance between compressor and air receiver should be as short as possible, with the elimination of sharp bends and fittings to a minimum, thus increasing the efficiency by reducing the friction. A globe or gate valve should never be placed in the discharge line between the compressor and air receiver unless a pop safety valve of sufficient area is installed in the discharge line on the compressor side.—*Trade Standards Adopted by Compressed Air Society.*

Strength of Chains

FROM numerous experiments it has been ascertained that the strength of a chain link is 1.63 times the strength of the bar from which it is made. The strength referred to is the breaking or tensile strength. It is never safe to strain to the breaking point, because every time a piece of metal is strained ot a point beyond its elastic limit it is permanently stretched and weakened.

For this reason it is never considered advisable to strain a chain to more than one-half the amount shown by the method given for computing the tensile strength. In other words the "proof test" of a chain should be about 50% of the ultimate resistance of the weakest link.

Example

What is the safe working strength of a chain made from ½-in. wrought iron whose tensile strength is 40,000 lb. per sq. in.?

Solution

Area = diam. square $\times$ .7854 = .5 $\times$ .5 $\times$ .7854 = .19635 .19635 $\times$ 40,000 = 7854.

7854 $\times$ 1.63 = 12802 lb. = ultimate breaking strength.

12802 $\times$ .50 = 6401 lb. = proof test, or safe working strength.—*Excavating Engineer.*

Sodium Aluminate for Water Softening

SODIUM aluminate has recently been put on the market for use in water softening. This material has always been considered prohibitive on account of cost. This cost is still high as compared with the use of lime and soda ash. There are, however, some cases where this material can be used to advantage. It reacts quickly in the cold, forming a flocculent precipitate which in cases of muddy waters takes the place of alum and at the same time acts as a softening agent. Our experience showed that the use of sodium aluminate combined with lime and soda ash gave a hardness of 70 parts per million as against 90 parts per million, which was the best we were able to obtain with straight lime-soda treatment. These experiments were carried out on a very hard cold water at an increased cost of 10 per cent over the straight lime-soda treatment.—*William M. Barr, in Chemical and Metallurgical Engineering.*

Production and Briquetting of Carbonized Lignite

THIS treatise, which is Bulletin No. 221 of the Bureau of Mines (Washington, D. C.) publications will some day have a greater interest for rock products producers than it has now. For as the field of production expands there will be a search for other fuels than coal, oil and natural gas which appear to be in such abundance today.

Lignite and peat are among the fuels of the future and both are found in large deposits in districts where they will be needed, that is, fairly remote from coal and oil fields. Both these fuels need some preparation for industrial and domestic uses. This bulletin gives the result of large scale experiments carried on in the North Dakota lignite fields by first carbonizing the lignite and afterward making it into briquettes. These briquettes had a heating value of 12,000 B.t.u. per lb. (ordinary bituminous coal has about 14,000) but burned very completely and gave more available heat per lb. than anthracite.

Cost of Dragline Operation

IT is rarely that figures are published on the cost of excavating large quantities of material by either steam shovel or dragline which cover a sufficient period to afford a good average or which are sufficiently authentic to be received without question. For this reason a series, "An Economic Study of Dragline Operations," by C. W. Ullom, recently published in *Engineering News-Record,* will be of interest to sand and gravel operators, phosphate rock producers and those quarrymen who employ a dragline for stripping.

Twenty-one draglines were used on the flood prevention work of the Miami Conservancy district, and it is from the records of these machines that the costs are taken. Various models of Bucyrus, Lidgerwood, Marion and Monighan machines were included, ranging from a small, steam operated, caterpillar mounted machine with a 32-ft. boom and ¾-yd. bucket to a large, electrically operated, truck mounted machine with 135-ft. boom and 4½-yd. bucket.

All kinds of work were done by these machines from simple side casting to loading into 12-yd. cars and into scows. Some of the material was transported and stockpiled. As the cost of different kinds of work were kept separately a valuable set of comparative figures has resulted.

Table I gives the work of three machines side casting and of one of these machines loading into scows and loading into 12-yd. cars. Side casting the machine averaged 1280 yd. Loading into scows the average dropped to 1060 yd. and loading into cars to 940 yd., a decrease of 26½%. This figure is worth remembering, as it is presumed the cars were kept coming to the machine as fast as they would be in a gravel pit.

Table II is of less interest to rock products operators as it has to do with the placing of material in embankments, but Table III, which is given here, is of great interest since it shows the cost of digging, transporting by scows and then unloading from scows to stockpile. The distance transported is not given but the size of the scow is stated to be 40x120x6 ft. The transportation cost is placed at $0.259 per ton. The total cost of $0.729 per ton placed in the stockpile would seem rather high to the average sand and gravel operator who must add the cost of screening and washing to that of the operations noted, stand some loss from washing and then sell his product at about the figure given here as the cost—in some cases less.

Table IV makes an interesting comparison between the work of (1) a dragline with a 100-ft. boom using a 2½ or 3½-yd. bucket (2), a dragline with a 125-ft. boom and either a 3½ or 4½-yd. bucket, and (3) a dragline with a 135-ft. boom with either a 3½ or 4½-yd. bucket. The biggest machine showed the highest cost 13.7c per yd. as against 8.2c and 8.5c for the other machines. Analysis of the figures shows that while the labor on the 135-ft. boom machine was the same as on the 125-ft. machine repairs were more than three times as much and the cost of cable was more. The smallest machine had a much lower labor cost although the repair cost per ton was much higher.

Nine of the 21 machines were electrically powered which gave an opportunity for an interesting comparison. The unit costs on a certain piece of work show a decided advantage in favor of electric power, the costs being $0.0753 per yd. for steam and $0.0643 for electricity. A further advantage of the electrically powered machine is that of moving under certain conditions. The cost of dismantling a steam dragline and hauling it 3¼ miles through the streets of Dayton was $7,820.57, while the cost of the same work on an electric machine was $3,666.45.

TABLE I—DRAGLINE EXCAVATION QUANTITIES ON THE DAYTON CHANNEL IMPROVEMENT

Machine	Class	No.	Total cu. yd.	Months	Mo. Average cu. yd.
Lidgerwood	K	D-16-8	890,000	28	31,800
Bucyrus	175	D-16-15	2,045,000	47	43,500
Bucyrus	175	D-16-16	1,502,000	46	32,650

For draglines working alone, excavating and casting material:

Machine	Average per month, cu. yd.	Maximum per month, cu. yd.	Average per 10-hr. shift during maximum month cu. yd.
D-16-8	31,800	56,400	1,130
D-16-15	43,300	87,500	1,700
D-16-16	40,200	69,100	1,280

Note—The machines work two 10-hour shifts per 24 hours excepting Sunday or 12 shifts per week.

For D-16-16, Bucyrus Class 175, digging and loading scows:

	Cu. yd.
Average quantity per month	19,000
Maximum quantity for one month	55,400
Average per 10-hr. shift during maximum month	1,060
Total quantity scowed	350,000
Average scow loaded	220 to 225

For D-16-16, Bucyrus Class 175, digging and loading trains:

	Cu. yd.
Average quantity per month	24,500
Maximum quantity for one month	48,800
Average per 10-hr. shift during maximum month	940
Total quantity	85,000

TABLE III—MATERIAL EXCAVATED BY D-16-16, SCOWED TO GRAVEL PLANT, AND PLACED IN STOCK PILE BY D-16-8 AT DAYTON

(Analysis of Field Cost for December, 1920)

Designation	Quantity cu. yd.	Cost	Unit cost	Per cent
Excavation by D-16-16	12,180	$2,473.55	$0.203	27.8
Transportation by steamboat and scows	12,180	3,162.82	0.259	35.5
Placing in stock pile by D-16-8	12,180	2.253.52	0.185	25.4
General items	12,180	1,003.70	0.082	11.3
Total	12,180	$8,893.59	$0.729	100.0

TABLE IV—CHANNEL EXCAVATION AT DAYTON, COST OF DRAGLINE OPERATION, ONE HANDLING

	D-16-8 for 7 months ending Aug. 31, 1922	D-16-15 for 16 months ending Aug. 31, 1921	D-16-16 for 16 months ending Aug. 31, 1921
Labor	$14,576.56	$37,171.79	$37,314.58
Supplies	1,093.56	2,435.55	7,331.21
Minor repairs	1,176.92	6,613.39	4,137.07
Fuel and power	3,976.94	16,586.17	15,772.43
Cable	1,753.74	3,770.43	4,768.52
Miscellaneous	105.64	355.28	161.04
Depreciation	1,750.00	17,010.00	18,305.96
Total	$24,434.36	$83 942.61	$87,790.81
Work done cu. yd.	299,050	981,989	641,510
Cost per cu. yd.	$0.082	$0.085	$0.137

Note—D-16-8 worked with 100 ft. boom and 2½ to 3½ cu. yd. bucket.
D-16-15 worked with 125 ft. boom and 3½ to 4½ cu. yd. bucket.
D-16-16 worked with 135 ft. boom and 3½ to 4½ cu. yd. bucket.

The Silica Refractories of Pennsylvania

THIS pamphlet of 100 pages is an excellent treatise on the production of refractory materials and their manufacture into such products as silica brick. It is a state publication, being Bulletin M-3 of the Topographical and Geological Survey and published by the Department of Forests and Waters, Harrisburg, Pa.

Silica brick, ganister, silica cement and mica schist are the four substances treated. Pennsylvania is much the largest producer of silica brick in the United States, occupying that position because of excellent raw material supplies and a home market. All of the production, excepting that from two plants, comes from a single geological formation and this formation is mapped and described in detail in this book.

The greater part of the book is given to the production of silica brick. Not much space is given to manufacturing details but there are excellent descriptions of the quarries from which the material is obtained and the methods of quarrying.

The quarrying and preparation of ganister and mica schist for furnace linings are also well described.

Nature, Preparation and Use of Pulverized Coal*

Part XIV—Practice of Burning Cement and Lime in Rotary Kilns Using Pulverized Coal as Fuel — Application to Rotary Dryers

By Richard K. Meade
Consulting Engineer, Baltimore, Md.

THE application of pulverized coal to the heating of rotary cement kilns was one of the first successful uses of this form of fuel. The apparatus employed has been quite fully described in the preceding articles. The jet of burning fuel is projected directly into the kiln and no preliminary combustion chamber is used. The feeder usually consists of a screw conveyor driven with some form of variable speed control and the burner of a cone and pipe arrangement such as is illustrated in Fig. 43. (Refer also to Figs. 28 to 31 inclusive, ROCK PRODUCTS, May 3 and May 31, 1924.)

The air employed is usually at a pressure of from 5 to 12 oz. at the blower outlet. A very few plants use high pressure air. The air supplied varies from about 25% of the theoretical quantity required for combustion to the theoretical amount. The velocity in the pipe leading from the burner to the kiln varies greatly at different plants but is usually about 100 ft. per second.

Table XVI gives the sizes of the pipes and burners for dry process kilns. These figures are presented merely for guidance, as the actual dimensions differ greatly at different works. Burners and pipes proportioned as in the table, however, will give good results for cement burning.

A round nozzle is employed and the size of this varies considerably at different plants. A few plants use two burners but by far the greater number use one burner only and this applies even in the case of the largest kilns. Usually the coal jet enters the kiln at a point a little below the center line and often a little to that side of it on which the material is carried up by the revolutions of the kiln.

No effort is made to control the length or other qualities of the flame by varying the quantities of air and fuel. If a short flame is desired, this is usually attained by reducing the draft of the kiln itself. This is done by opening a door in the stack base which serves as a damper. The flame is usually impinged on the material and the lining of the kiln is protected by coating the brick with the cement material itself.

The coal is usually ground about 90% to 92% passing a 100-mesh sieve. A few plants grind finer and others somewhat coarser. Good results can be attained with a bituminous coal when the latter is ground as coarsely as 85% to 90% through the 100-mesh sieve. There appears to be no reason for excessive fine grinding of bituminous coal which is designed for heating cement kilns.

Cement kilns operate at a temperature ranging between 2400 deg. and 2600 deg. F. The draft at the base of the stack is about 0.6-in. of water and at the discharge end about 0.3-in. of water. The velocity of the gases through the combustion zone of the kiln is at the rate of about 1400 ft. per minute. Stack gases in the dry process range from 1400 deg. to 1800 deg. F. and in the wet process from 900 deg. to 1300 deg. F. Waste heat boilers may be employed after the kilns, and the steam so generated will usually amount to something between 3 and 4.5 lb. per pound of coal burned in the kiln.

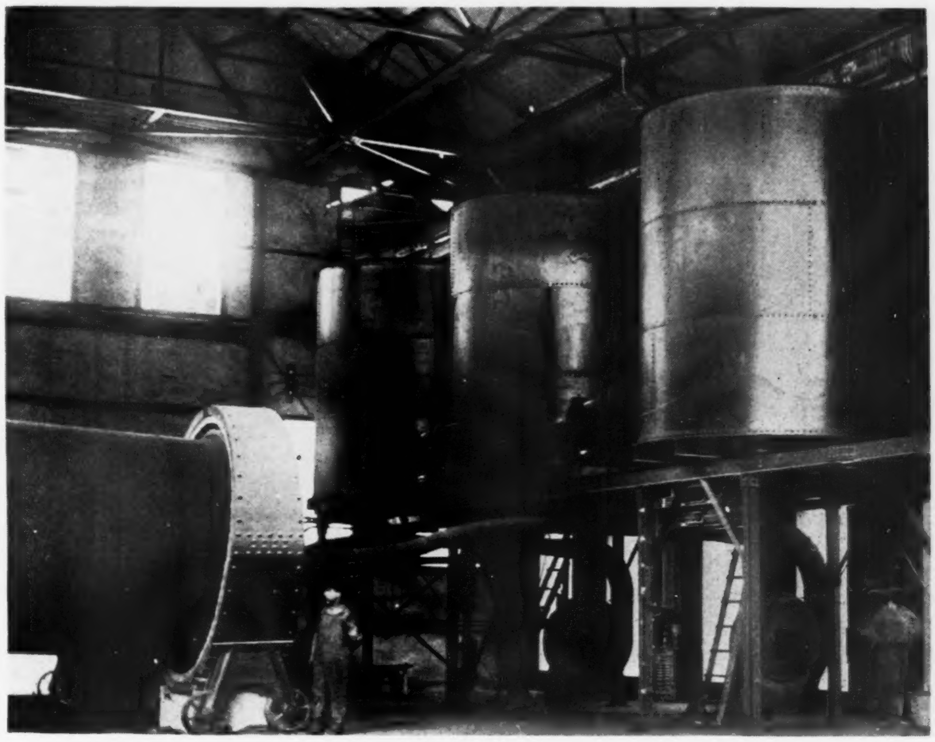


Fig. 43—Rotary kiln heated by pulverized coal

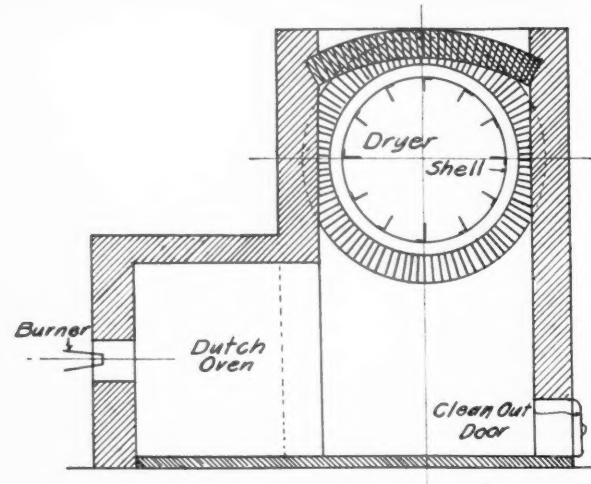
TABLE XVI. DATA ON PULVERIZED COAL INSTALLATIONS FOR ROTARY CEMENT KILNS

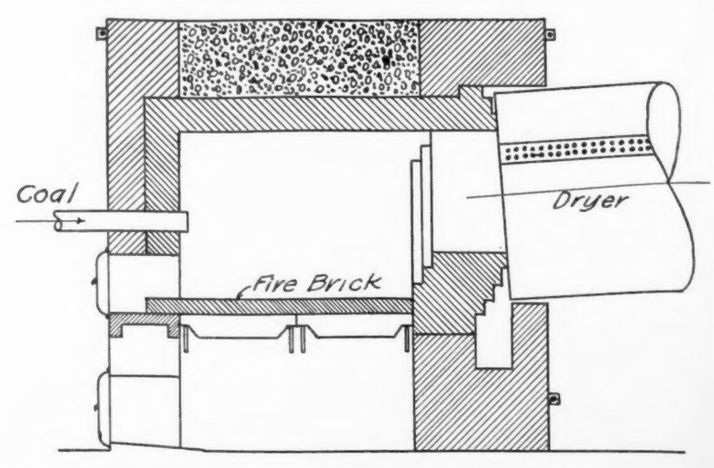
Size of Kiln — Diam., ft.	Size of Kiln — Length, ft.	Output, barrels of cement per day*	Coal required per barrel, lbs.*	Coal required per minute, lbs.	Air required for complete combustion of coal, cu. ft. per minute	Burner — Diam. of nozzle, ins.	Burner — Diam. of pipe to kiln, ins.
6	60	200	110	15	1875	3	5¼
7	100	430	90	27	3370	4	7
8	125	700	90	44	5500	5¼	9¼
9	150	1100	90	69	8625	6⅝	11¼

*Wet process kilns require about 33⅓% more fuel than dry process kilns of the same size and their output is reduced by about the same amount.

Rotary Lime Kilns

The remarks covering the application of powdered coal to cement kilns apply for the most part to rotary lime kilns. The same





Left—Fig. 44. Coal dryer heated by powdered coal. Arrangement of Dutch oven and burners; right—Fig. 45. Arrangement for firing dryers with pulverized coal when ordinary fire-box is installed

form of burner may be used with advantage. Lime kilns operate at a lower temperature than cement kilns and hence somewhat finer grinding of the coal is indicated. The general practice, however, is not finer than 92% passing the 100-mesh sieve.

The great majority of lime kilns are heated by the unit system in which each kiln has its own pulverizer. This is because most rotary kiln lime plants consist of one or two kilns only and hence would not warrant the installation of an expensive coal pulverizing plant. A few of the larger rotary kiln lime plants, notably that of the government plant at Muscle Shoals, have a central coal pulverizing plant.

The unit system (Aero pulverizer, Fig. 47) gives good results with lime kilns and usually the coal will not have to be dried when this pulverizer is employed. With Eastern coals, no dryer need be provided and only where coal of a very poor grade (less than 10,000 B.t.u. per pound), which carries considerable moisture (over 10%), is employed need a dryer be considered. With the unit system the arrangement of pulverizer and rolls shown in Fig. 12 (see August 25, 1923, Rock Products) may often be followed.

Lime kilns heated with pulverized coal will have about 15% more capacity than the same kiln heated by producer gas. The fuel-lime ratio will also be much better. The coal ash will detract somewhat from the purity of the lime but not enough to interfere with its use for any except the most exacting requirements. When the lime is hydrated or employed for building, the writer has never seen any difference in either the color or mortar properties of lime made with producer gas and pulverized coal. From the nature of the case, a low ash coal is desirable on this score as well as for economy and possibly a coal with an ash low in iron (white ash coal) is also to be chosen when preference of a number of coals is offered.

The capacity and coal consumption of rotary kilns and the corresponding size Aero pulverizer necessary to heat these properly are given in Table XVII.

TABLE XVII. CAPACITY, ETC., OF ROTARY LIME KILNS

—Size of Kiln— Diam., ft.	Length, ft.	Output of lime per 24 hrs., tons	Coal required per hr., lbs.	Aero pulverizer, size
6	60	28	775	B
7	100	60	1550	D
8	125	100	2400	E
9	150	150	3600	G

Lime kilns operate at a temperature of from 1800 deg. F. to 2200 deg. F. Stack temperatures are about 1440 deg. F. Draft at base of stack is generally from 0.5 to 0.6 in. of water and at the front end of the kiln about 0.3 in. of water. Waste heat boilers may be employed. The steam developed from the gases should then be about 3 lb. of steam per pound of coal burned.

Quite analogous to the burning of lime in a rotary kiln is the manufacture of magnesia which is burned from magnesite. Owing to the fact that magnesite occurs in that part of the country (California) where oil is cheap compared to coal, oil is generally used for heating kilns so employed, but pulverized coal could be used.

A material is employed for lining steel furnaces which consists of a mixture of dolomite and a small amount of iron ore ground finely and burned at a fairly high temperature in a rotary kiln. Practically all kilns so employed are heated by pulverized coal and the installations are similar to those in the cement and lime industry. It might also be said that attempts to burn this material by the use of coal on especially designed grates and furnaces were failures, although oil can be used where it is cheap enough.

Rotary Dryers

Rotary dryers are of two kinds, direct and indirect heat. In the case of direct heat dryers the products of combustion pass through the dryer itself coming in contact with the materials to be dried, while with the indirect heat dryers the products of combustion are kept on the outside of the dryer and do not come in contact with the material itself, the heat being transmitted to the latter through the shell of the dryer. In the case of small dryers, little economy can probably be shown by the substitution of pulverized coal for hand firing, but with large dryers the saving in both labor and fuel is quite noticeable and the capacity of the dryer is increased, etc.

The temperature of a dryer is kept too low to admit of proper combustion in the dryer itself and this is usually secured by employing a fire box or combustion cham-

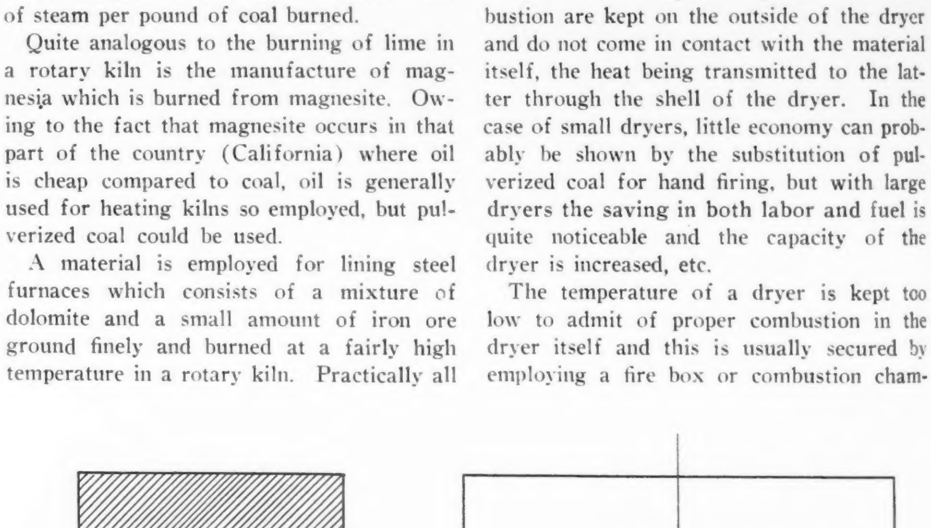


Fig. 46—Installation of powdered coal for heating dryers

ber at the end of the dryer. In the case of an indirect heat dryer, a Dutch oven is built to one side of the dryer as shown in Fig. 44.

When it is desired to change a grate or stoker fired dryer to pulverized coal, the installation is simple and nothing is necessary except to tear out the grate bars and protect the end of the dryer from burning out by a proper shield of fire brick if this does not already exist. The fire doors are then removed and the burners inserted in their place, the space around being stopped up with fire brick. If the furnace is small it hour. If the material to be dried contains say 5% moisture, there would have to be evaporated 105 lb. of water per ton of dried material and the capacity of the dryer would be from 23 to 28 tons of dried material per hour.

The fuel requirements are about 1 lb. of coal for every 5 or 6 lb. of water. The above dryer would, therefore, require about 588 lb. of coal per hour based on the lesser ratio and the greatest capacity. (See also Table VI, June 30, 1923.)

(To be concluded)

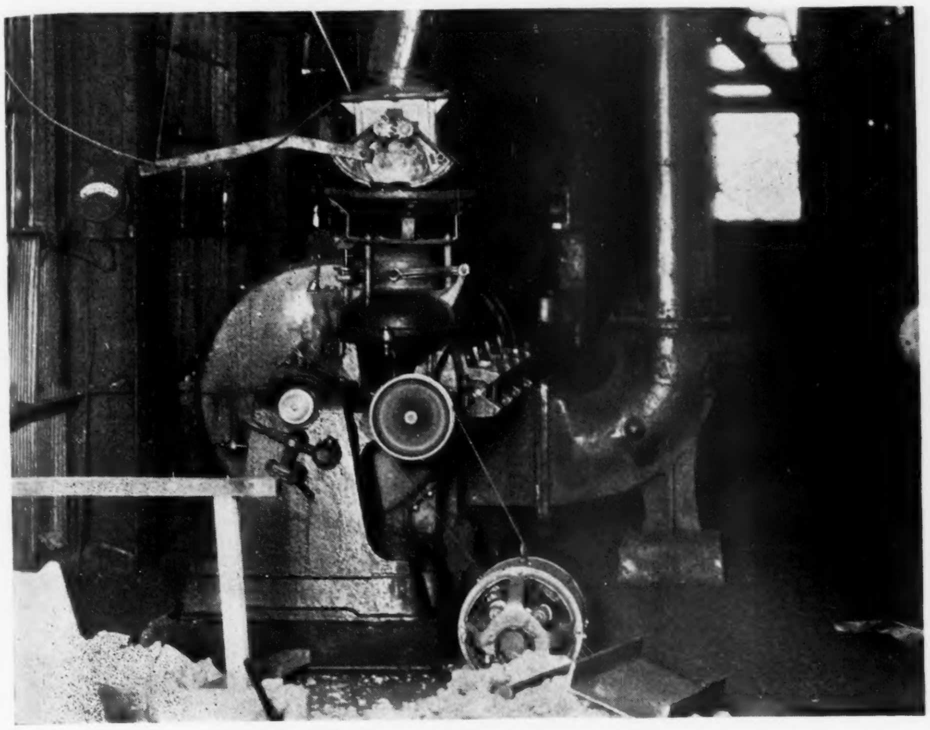


Fig. 47—Aero unit system which unites all the various devices required for pulverizing and firing in a compact form

may be necessary to make a few openings in the side to protect the walls, etc. Fig. 45 shows the installation of powdered coal in an old grate setting.

With dryers a slow, lazy flame is desired, hence only a small amount of air is allowed to enter with the coal and the balance is drawn in through openings in the front and sides of the furnace.

When a new dryer is to be installed a combustion chamber of special design may be employed, and such a combustion chamber will be somewhat cheaper than the ordinary dryer fire box. Fig. 46 gives the details of such a combustion chamber suitable for a 5x50-ft. rotary dryer. Modification of this design to suit various other sizes can easily be made by allowing about the same proportion between the combustion space and the dryer.

The capacity of an ordinary rotary dryer, where the length is about 10 times the diameter, is about 125 to 150 lb. of water evaporated per square foot of cross section per hour. The area of cross section of a 5-ft. diameter dryer, for example, is 19.6 sq. ft. If this dryer is 50 ft. long, its capacity is therefore from 2450 to 2940 lb. of water per

A "Chicken Gravel" Mine

By Kirby Thomas, Mining Engineer, New York City

THE often told and variously placed fireside story of the finding of nuggets of gold in the gizzards of fowl and the sometimes resulting mad search for a gold mine in the family barnyard or in neighborhood gravel banks must have been the inspirational suggestion from which developed a curious mining undertaking now being carried on with fine profit in Connecticut.

Some ingenious Yankee, possibly descended from the originator of the "wooden nutmeg" business which has made Connecticut famous in history, knowing something concerning the internal affairs of the members of the bird family sought to make profit of this knowledge in a characteristic Yankee way. As everybody knows, birds everywhere, in default of real dental equipment, grind the food for digestion in a muscular sack filled with bits of stone, called the gizzard. The domestic fowl, confined in city lots and in barns, has no natural opportunity to get the needful supply of this grinding material. Hence the great idea.

An outcropping ledge of pegmatite, a coarse granular eruptive rock with crystals of feldspar, quartz and mica was availed of and suitable crushing and sorting machinery installed. The business has assumed large size and the bags and cartons are eagerly bought by the many small poultry raisers of the tributary region at prices that make the business of mining "chicken gravel" very lucrative. In fact this barren rock from the Connecticut hillside brings more per ton than does the ore from many a rich gold mine in the West.

The best grade of the feldspar from this mine is saved separately and sold for glazing material for the pottery trade and the mica flakes are blown out and used to coat roofing material. But the principal and best paying product is that which supplies the special and unique requirements of the domestic fowl.

Used Too Lean a Mixture or a Poor Aggregate

CHARGES that the "mixture of the concrete blocks seemed too lean," in the Hampden County Memorial bridge where a taxicab knocked 15 feet of the balustrade into the Connecticut River, is contained in a report which Thomas H. Benton, supervisor of motor vehicles, has sent to John Hall, one of the Democratic candidates for county commissioner. He says that either not enough cement was used in the mixture or that the sand was too fine, or had a mixture of loam or clay, or that the mixture was too lean for one or all of these reasons.

He says that the balustrade has no tensile strength as it was not joined to the other sections. Its bulk seemed to guarantee a strength which it did not possess, he said. He arrives at the conclusions that these balustrated sections would not materially check any vehicle weighing a ton running five miles an hour, and its resistance would be nil against a trolly car running at its lowest possible speed.—*Springfield (Mass.) Union.*

New Silica Sand Plant at Pacific, Missouri

ROBT. A. BAGNELL, first vice-president of the Pioneer Silica Products Co., of St. Louis, has a force of men tearing down the McNay-Fazold sand plant at Pacific, Mo., and getting the ground leveled off preparatory to the erection of the big sand plant that is to be built on that site.

The new building will be 96x60 ft. and will contain crushers, dryers and grinders for the making of silica flour. This flour is used in foundries, in the making of china, glass, soaps, etc., and will be shipped both in box cars lined with paper and in sacks similar to cement sacks.

The company expects to start the erection of the new plant soon and will employ a force of 25 men when in operation.—*Pacific (Mo.) Transcript.*

Value of a System of Truck Delivery to Agricultural Lime and "Agstone" Producers

A Practical Suggestion for Lengthening the Operating Season

By J. B. R. Dickey
Extension Agronomist, Pennsylvania State College, State College, Penn.

THE PRODUCTION of agricultural lime or limestone, is under a great handicap from an economic standpoint on account of the fact that the demand is very largely confined to a comparatively few months. The producer must have large storage capacity and be at the added expense of putting his product into storage and getting it out again, or else let his plant stand idle and allow his men to scatter during the months of the low consumption. He is also up against the financial difficulty of having little or no income during much of the year.

In the northern part of Pennsylvania where seeding is done largely with oats, nearly all demand for lime is during February, March and April. On account of bad roads a large part of this demand is crowded into the latter half of April. As a result of inability to get shipment on all orders at this time and the press of farm work the number of acres limed and applications per acre are much too small.

Late Summer Demand

In the central and southern part of the state, where most of the seeding is with wheat, the greatest demand for lime is during August and September, though some lime is still applied to corn ground in spring. Both spring and late summer are very apt to be seasons of car shortage and freight embargo, shipments of fertilizer in spring and of grain in the fall getting the preference over lime in the demand for box cars.

May, June and July, and later October and November, five of the best operating months, often find the lime producers with little or no active demand. During these months farmers are too busy with haying, harvest and later with fall work to have time to prepare for their future needs of lime. Although they are too busy to haul lime at these seasons, most of them would be glad to purchase lime if arrangements could be made to have it delivered on their farms.

A Fair Profit on the Hauling

Some enterprising operators have used trucks for this purpose with satisfaction and profit and have kept their plants running full time through nearly the whole season. A charge, generally between 15 and 20 cents per ton per mile, is made for the hauling. The charge depends somewhat on the condition of the roads but is sufficient to give the operator a fair profit on the operation of his truck and at the same time is generally much less than it would cost the farmer to haul the material with his own teams. A haul of 10 miles over good roads at this rate would be only $1.50 to $2.00 per ton. With a team only one load per day could be hauled this distance. With a five mile haul the farmer could not make over two trips per day with horses. His time and that of his team should be worth at least $5.00 per day.

With truck delivery the area which a plant can supply without freight shipment can be doubled in radius and consequently quadrupled in size. Eight miles is a long distance to haul lime with horses, but 16 miles over fair roads is not too far with a truck and would cost only about $3.00 per ton. The lowest freight rate in Pennsylvania on lime and limestone is about $1.00 per ton. Shipment by rail is not to be compared from a farmer's standpoint to delivery on the farm since many are located a long distance from a shipping point. Cars must be unloaded promptly on arrival regardless of the condition of the roads or the press of other work. A minimum carload is also generally much more than the average farmer needs or cares to handle at one time.

Illustration of Trucking Plant

As an illustration of how the truck delivery plan works in practice, one small pulverizing plant in Lancaster County, producing about 25 tons of agricultural limestone per day, was able with two trucks, one a 3-ton and the other about 1½-ton, to keep running nearly all summer with a storage bin holding only about 100 tons. A day or two in the field with an order book always secured the manager enough business to keep the plant and the trucks busy for several weeks. Some solicitation of orders, in addition to advertising seems necessary to secure adequate local trade.

Several of the larger plants in southeastern Pennsylvania are also using trucks advantageously for the delivery of limestone, burned and hydrated lime. Some farmers are willing to hire the hauling done by independent truckers but this is generally more expensive and requires additional negotiations which are obstacles in the way of the farmer getting his requirements. A definite offer at a certain price per ton *delivered on the farm* or in the field is very attractive to a farmer with his scanty help and teams fully occupied with routine farm work.

The Problem of Storage

The question of storage of unsacked limestone until needed bothers some purchasers unnecessarily. Exposure to rain does not injure limestone except in making it difficult to spread by machinery. There is generally some shed or barn floor where it can be held. If not, it may be dumped in the field where needed, though boards under the pile to prevent moisture from coming up from below and a rude covering of boards or corn fodder to shed the bulk of the rain will pay for the trouble.

It is also possible for dealers in lime or limestone to employ a system of truck delivery and thereby greatly increase their business. If they do not care to invest in trucks arrangements can often be made with local truckmen for delivery to farms at a reasonable rate. Operators of plants could probably afford to offer lower prices on lime during certain months as an inducement to purchase during these months, rather than to close their plants or put the material into storage.

New Method of Making Calcium Arsenate

DIRECT production of a soluble arsenate from native ores in which the arsenic is present as arsenate has been suggested by James G. Lamb, of Denver, Colo. Pulverized ore is mixed with caustic soda (8 parts ore to 3 parts NaOH as hot 50% solution. The thin paste sets to a porous solid mass that is leached with hot water to give a solution of sodium arsenate. To this, slaked lime in an emulsion form is added to precipitate calcium arsenate. As the calcium arsenate is thus formed directly from the ore without white arsenic as an intermediate step, the formation of poisonous gases and irritating dust is avoided. (Patent No. 1504627, assigned to American Smelting & Refining Co., New York, Aug. 12, 1924.)

Jottings on the Rock Products Industry in New York and New England

Hudson River Quarries Among the Country's Most Prosperous—Half a Dozen New Lime Plants in Massachusetts and Vermont

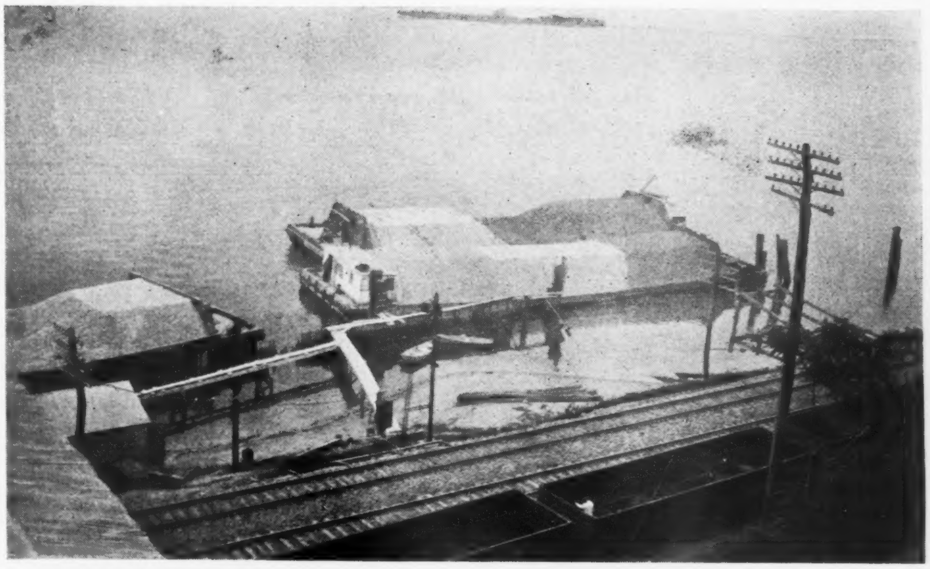
By Nathan C. Rockwood
Editor-Manager, Rock Products

THREE weeks in eastern New York state and New England is all too short a period to adequately "cover" the plants I should like to, but even this short visit has left several impressions of the industry as a whole, which in general seems to be in a busy and prosperous condition.

Hudson River Quarries

Few great cities are more favorably located and get huge supplies of most building material near at hand than New York. Long Island is practically all sand and gravel, and in the bluffs along the Hudson river there are miles of deposits of trap rock and limestone. There are also large deposits of sand and gravel along the Hudson and huge clay deposits where brick are burned. The great cement producing sections of New Jersey, Pennsylvania and New York are within a radius of less than 200 miles.

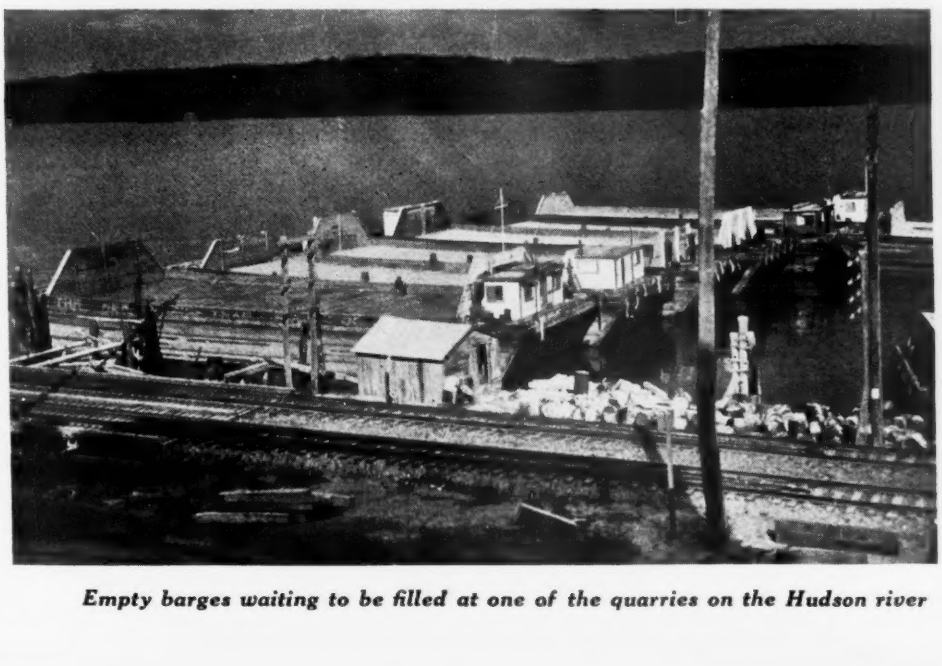
Despite the fact that the Palisades are a continuous deposit of trap rock for many miles on the west side of the river above the city, this source of crushed stone is no longer available, and the New York Trap Rock Co. is no longer a producer of trap rock. Their last trap rock quarry on the river at Rockland Lake was discontinued by the Palisades Park commission several years ago, which took over the entire Palisades territory as a state park. This deposit is still quarried at a number of places on the west slope, away from the river, but at these places they have no water transportation outlet and the operations are relatively small.



The filled barges are carefully trimmed off to definite surfaces so that the load may be measured

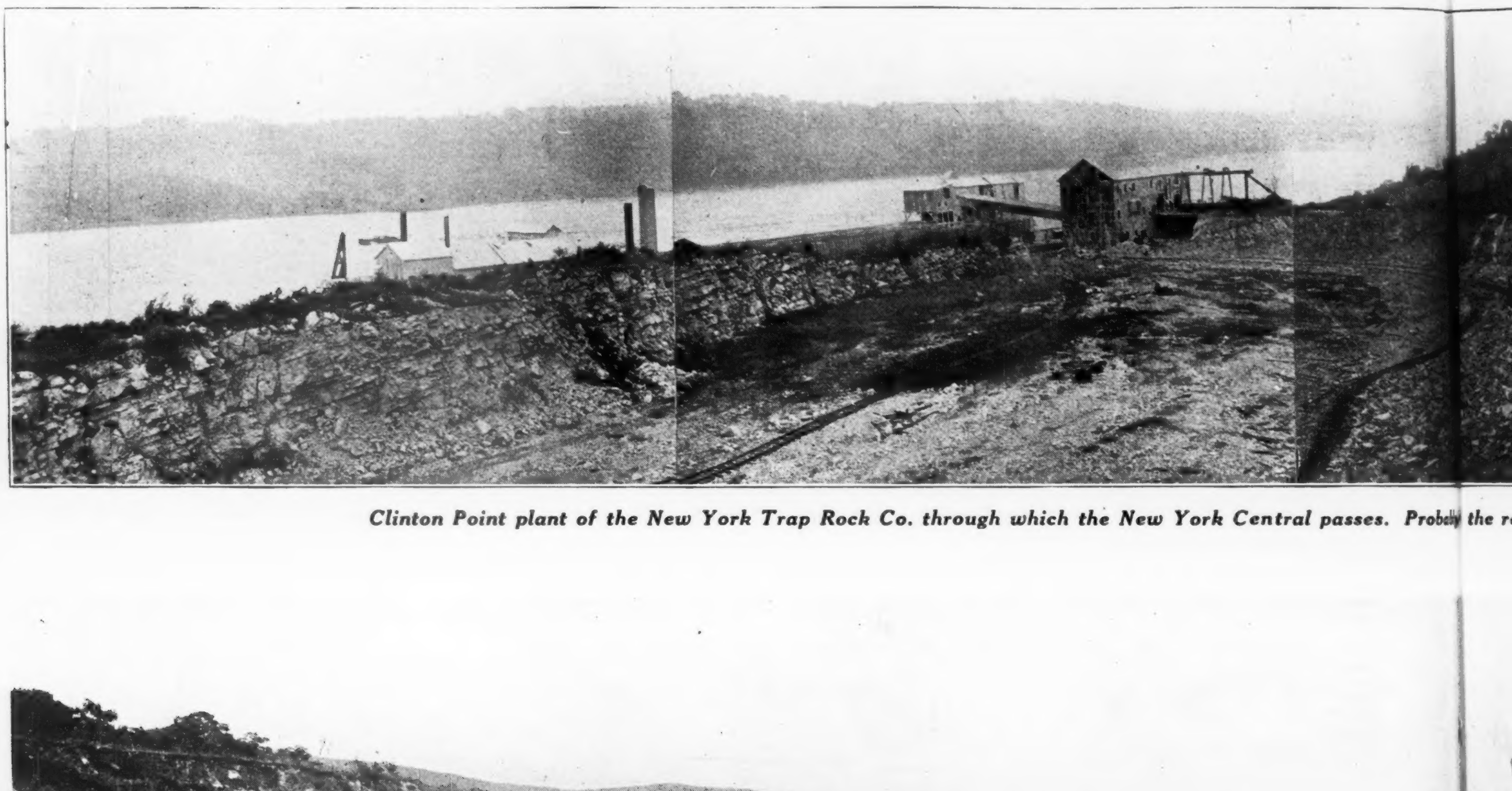
There remain four notable quarries on the banks of the Hudson river. They are all limestone quarries, but the stone is hard and is beginning to be preferred in concrete work in the city. Two of these quarries are on the east side of the river, one below Poughkeepsie and the other near Peekskill, and two are on the west side, one near Marlboro and the other at Tomkins Cove. The three first named are operated by the New York Trap Rock Co. and the fourth by the Tomkins Cove Stone Co.

Probably quarrymen have frequently passed through the Clinton Point crushing plant of the New York Trap Rock Co., about 12 miles below Poughkeepsie, in their trips to New York via the New York Central railroad, and have never known it. The main tracks actually pass right through the plant, a part of it being on each side, but the average speed of the trains at this point is probably close to 70 miles an hour and you do not get a passing glimpse unless you are on the lookout. This proximity to the main line of one of the most notable railways in

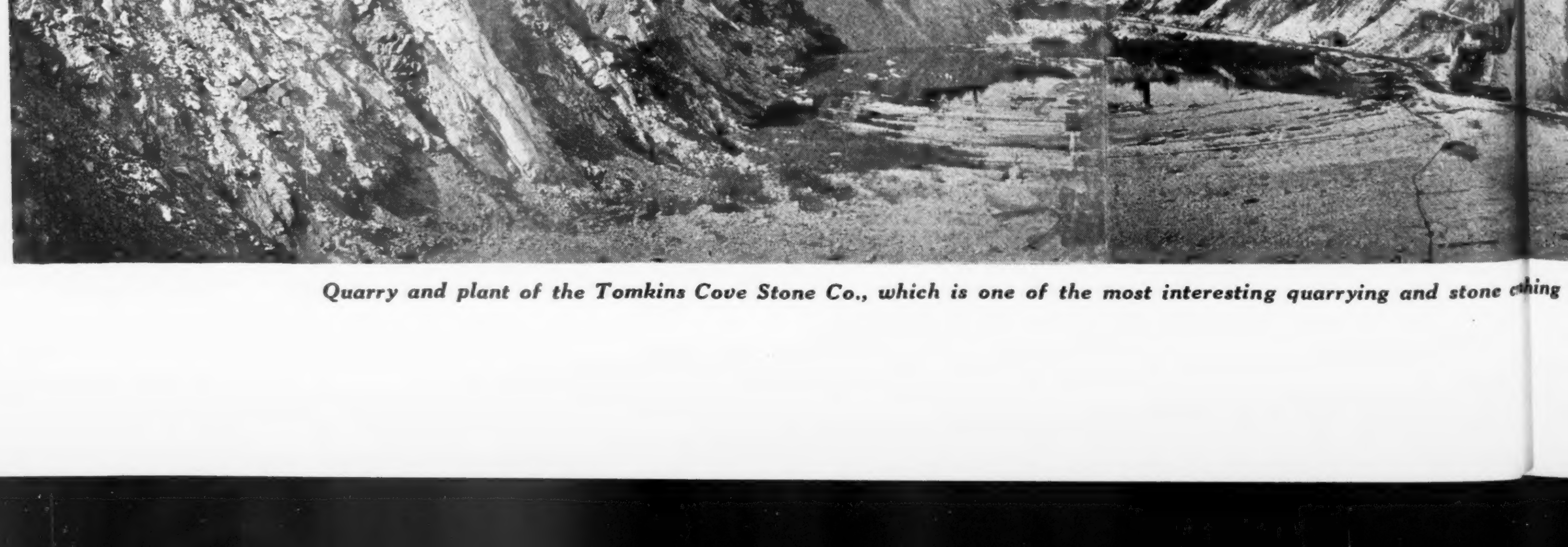


Empty barges waiting to be filled at one of the quarries on the Hudson river

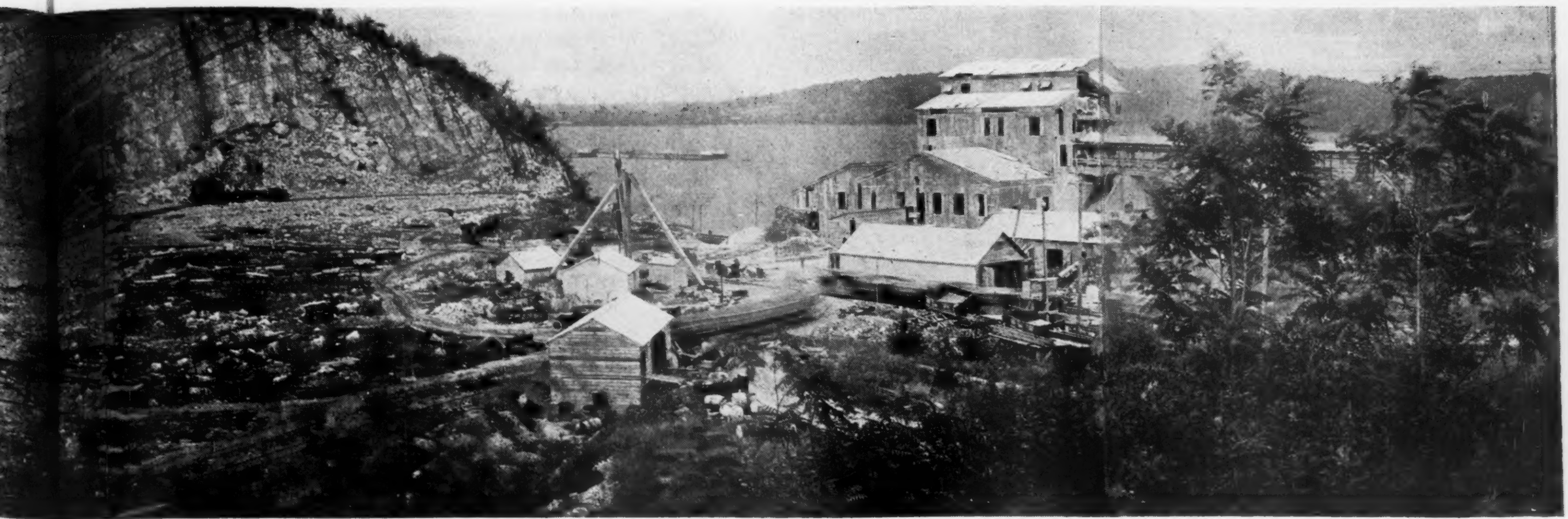
Cedar Cliff quarry and plant of the New York Trap Rock Co., which no longer produces trap rock but only li



Clinton Point plant of the New York Trap Rock Co. through which the New York Central passes. Probably the r



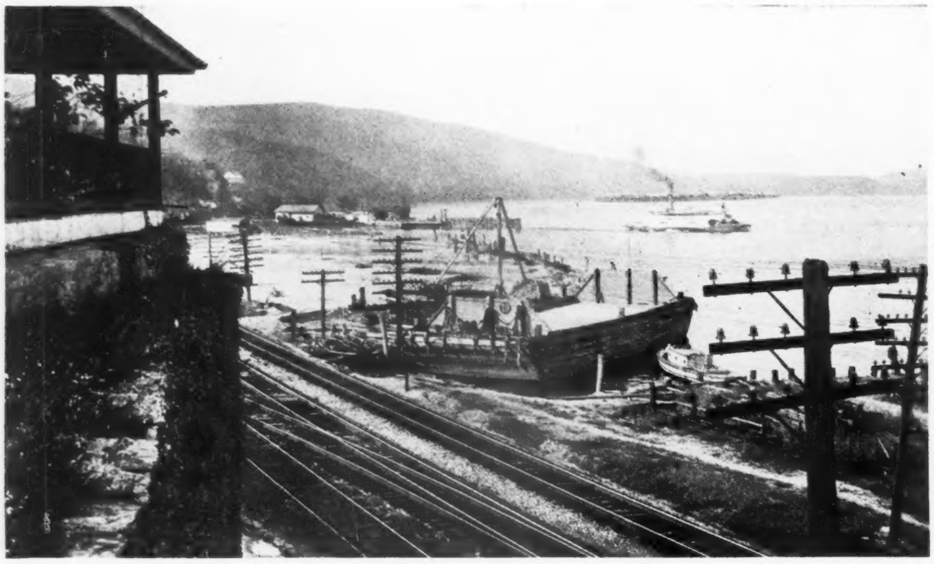
Quarry and plant of the Tomkins Cove Stone Co., which is one of the most interesting quarrying and stone c...hing



rock l— only limestone. This is one of three quarries on the Hudson river operated by this company

Probab— the reader has passed through this plant on the train—at 70 miles an hour—without realizing the fact

stone c—hing operations in the vicinity of New York City. It is at Tomkins Cove on the west side of the Hudson river



View of the water front at Tomkins Cove

the world requires special precautions in quarrying and plant operation.

The Cedar Cliff plant is not quite opposite, being farther south, on the opposite side of the Hudson. This plant has been much improved and enlarged during the last two years. A story on this plant will appear in a forthcoming issue. The Verplanck crushing plant of the company was burned early in the season and is in the process of being rebuilt; the limestone pulverizing plant, however, is in operation. This furnishes a large part of the limestone filler used in New York City asphalt pavements.

The Tomkins Cove Stone Co. plant has been described in these pages (September 23, 1922) and is by far one of the most interesting quarry operations in this country. A wonderful face has been developed in two levels, the lower level being some 20 ft. below the water level of the Hudson river. Some special features of this operation will be described in a forthcoming issue.

The annual production of these four quarries must be in the neighborhood of 1,500,000 cu. yd. (approximately 2,000,000 tons) a year. Everything is sold on a cubic yard basis. In order to arrive at an estimate of barge or scow cargoes the deck loads of different sized stone are separated and beautifully "trimmed," as one or two of the views herewith show. This trimming is done by the "captain" of the barge or scow, and aside from being night and day watchman this appears to be about his only work.

The scows range from 400 to 600 cu. yd. capacity and are both owned and leased by the quarry operators. They are towed to the waterfront of New York City and back by a towing company that specializes in this traffic for a fixed sum per cubic yard or ton, with a guaranteed minimum. The charge, of course, is much less than railway freight for the same distance. The scows are unloaded by the contractor or dealer who receives them.

New England Sand and Gravel Business

There are so many small deposits of good sand and gravel throughout New England and so few large deposits that sand and gravel operations to compare with those in other parts of the country are rare. Most of the operations are dry screening, roadside, auto truck propositions. They are so numerous that rail shipments of sand and gravel are much less common than in other sections of the country. Because of their competition, one of the most interesting dredging plants in this part of the country has been abandoned—the West Peabody (Mass.) plant of the New England Sand and Gravel Co. This was a 12-in. suction dredge, gravity screening operation, described in Rock Products, November 18, 1922. The company still operates two dry screening plants, but is going to make concrete products manufacture its principal business, under the name of the New England Concrete Products Co.

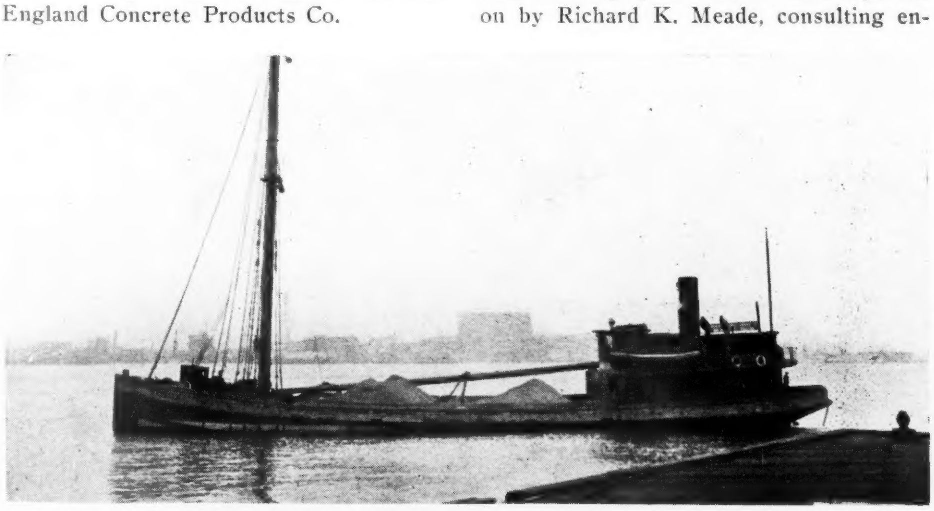
The Boston metropolitan district is supplied with sand and gravel largely by two large operators who have waterfront properties and marine equipment. These are the Scully company, which operates a 2000-ton per day ladder dredge near Quincy in a river deposit and the Boston Sand and Gravel Co., which dredges three different kinds of sea sand in as many different places along the north shore from Salem south, and operates a 2500-ton per day washing and screening plant at Greenbush on the south shore.

The marine equipment of this company is probably unique in the sand and gravel industry for it consists not only of the usual flat-bottomed scows but of ocean-going lighters which tow the barges, carry a hold and deck load of about 600 tons themselves, and are equipped with a derrick boom and clamshell for both unloading their own cargoes and the barges, and for dredging sand on the underwater beaches.

The original sand and gravel plant of the Boston Sand and Gravel Co. at Greenbush was described in Rock Products, April 12, 1919, but since then the entire scheme of pit operation has been changed and the plant has been reconstructed. The present plant will be described in a forthcoming issue.

The New England Lime Business

The big news in the New England lime business and its prospects we told in our issue of September 20, in announcing the association of W. R. Phillips with the New England Portland Cement and Lime Co. This company plans the immediate construction of a lime plant at Rockland, Maine, and as fast as the organization can be mustered will begin the design and erection of a portland cement plant also, the initial unit to manufacture 2000 bbl. a day. The projectors estimate they have a potential market to be reached by water transportation alone of more than this output. The quarry property has been very thoroughly core-drilled and reported on by Richard K. Meade, consulting en-



One of the unique dredges of the Boston Sand and Gravel Co., ocean-going vessels that dredge, carry cargo and tow barges

gineer, Baltimore, Md., and other experts.

A trip to Rockland found the Rockland and Rockport Lime Corp., busy and making improvements, as usual. The continuous-draw shaft kilns are continuously drawn no longer, for they have been chopped off and draw shears and other devices added. Two new 500-ton lime storage tanks have been erected and other changes made which will be described in a subsequent issue. President George B. Wood has added to his operating staff Warren E. Hill, a recent graduate in chemical engineering of the Massachusetts Institute of Technology, who is busy on efficiency and development work. Mr. Wood is himself a graduate electrical engineer and his general superintendent, William Bird, is a graduate civil engineer, so we find here quite a muster of technical brains and energy for a single lime-manufacturing organization.

The lime industry in western Massachusetts and Vermont has seen quite a remarkable development during the last two years. Besides the new rotary-kiln plant of the Tobey Lime Co., West Stockbridge, Mass., described in our issue of July 12, 1924, another new rotary kiln plant has been put in operation within the past year by the New England Lime Co. This plant is at Rockdale, near Stockbridge and is reported to be producing to capacity. The Vermarco Lime Co., West Rutland, Vermont, put its second 120-ft. rotary kiln into operation on September 27, the very day the writer dropped in for a call. This company had operated one 120-ft. rotary kiln for about eight years, using producer gas for burning. Both kilns are now using oil burners.

Incidentally, at the time of the writer's visit, the No. 1 kiln was shut down to repair a section of the lining. This was the first replacement of the kiln lining since the kiln was started in operation *eight years ago*. This is believed to be a world's record for life of a rotary lime kiln lining. "Crescent" fire brick were used and are being used for the replacement. It remains to be seen how long the linings will last with oil burners. The No. 1 kiln had been operated about six months with an oil burner before shutting down. The kilns have not been operated with oil burners long enough for comparative figures, but, according to Superintendent Montgomery, there is an apparent saving in cost of production owing to labor elimination, although the lime-fuel ratio on a dollars and cents basis is a little unfavorable to oil fuel.

This is, so far as the writer knows, the only high calcium lime plant which has actually succeeded in making a generally accepted finishing hydrate which is said to compete successfully with the Ohio dolomite hydrates. Our theory to account for this used to be that it was because the lime was an exceptionally soft burned lime—the chief trouble with the original gas-producer installation being to burn the stone enough to make the kiln turn out lime. But the lime burned with the much more intense oil flame appears to make every bit as good a finishing hydrate, so we shall have to look for the cause in the inherent properties of the stone rather than in the character of the burning operation. That the lime is harder burned than previously is shown by the greater difficulty with which it hydrates.

It is interesting in this connection that during a recent visit with Dr. Oliver Bowles at the U. S. Bureau of Mines' non-metallics experiment station, New Brunswick, N. J., the progress of X-Ray, microscopic photography was discussed and some thought given to a study of limestones by this means of research. It is now possible, by micro-photography, using X-Ray to actually see the molecular construction of crystals. Perhaps when the 900 or more different crystals and combinations of crystals which are found in various forms of calcium carbonate (limestone) are studied by these methods we shall come to learn why limes burned from these different stones vary so widely in character.

Besides the three plants referred to three entirely new shaft kiln lime plants have been built, or are nearing completion in Vermont, and the Farnum-Cheshire Lime Co., at Cheshire, Massachusetts, is just putting in operation several new kilns, as well as replacing some older ones, making a total of about 18 kilns in operation at the present time. This plant has specialized in finishing lime for the New York City market for many years.

The new plant now under construction at Winooski for Brewster & Co., will be one of the most modern shaft-kiln lime plants in the world, and will have many features entirely new to the lime industry. The furnaces will have mechanical stokers and the handling of both lime and fuel will be practically automatic.

Other new Vermont shaft-kiln plants are at Danby and High Gate Springs, near St. Albans.

After the war the lime industry of this section enjoyed a considerable boom. The present year, however, has not been a particularly profitable one, especially for the smaller operators. The larger companies all report good business and fair prices, but many of the smaller operators appear to have resorted to price-cutting and desperate methods to get business. One can not help drawing the conclusion that big buyers of lime are influenced in buying fully as much, if not more, by the reputation, stability and service of the larger companies, than by price. Moreover, the large operators through adequate sales organizations, are able to have a much more varied business and ship over a wider territory. The ultimate salvation of the small operator must eventually be consolidation or association into one or more selling and distribution organizations or agencies.

It is interesting to note that the Vermont marble industry was once on a very similar basis—hosts of smaller operators, all producing for little more than day wages. Then an organizing genius—the late Col. Proctor—consolidated many of these small operations and developed an organization for advertising, selling and distribution, and now the marble industry has grown to be the most important industry in the state, with a distribution over the entire country.

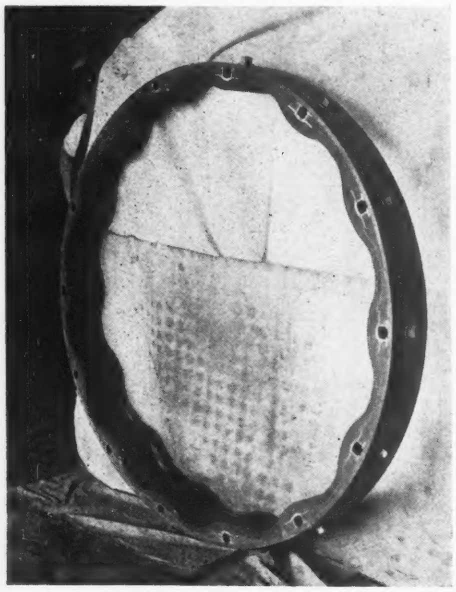

Left—View of one of the ocean-going lighters showing deck load. Right—The empty lighter showing cargo boxes

Rubber Lining for Rotary Grinding Mills

Experiments Which Show Lessened Wear and Increased Grinding Efficiency

By R. B. Donnelly

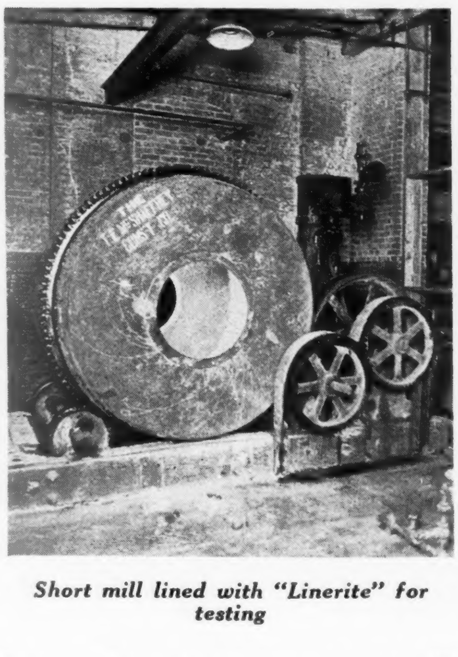
THAT rubber, in a compounded form, may be successfully used in grinding mill practice for lining rotary pulverizers, at first thought, seems almost incredible. Only after a review of the present day uses of rubber as a resistant to abrasion, does it appear a thoroughly natural and logical use. Compounds of soft rubber are made today, which withstand the action of abrasion and friction better than the hardest steel. There are rubber conveyor belts handling hundreds of thousands of tons of raw stone and clinker, year after year, before the thin ⅛-in. cover is worn through. Rubber elevator belts lift heavy steel buckets carrying sharp, wet fines, in stone crushing; and for many months the fines may work under the buckets and be ground against the belt as it passes over the pulleys, without any resulting signs of wear. No substance can compare with rubber in resistance to the sand blast. Even in bearings rubber is taking its place as the longest wearing surface wherever water may be used as a lubricant. There are a multitude of other examples where rubber is daily demonstrating its ability to resist wear, the most familiar of which is the rubber automobile tire.



Section of "wave type" lining and method of fastening

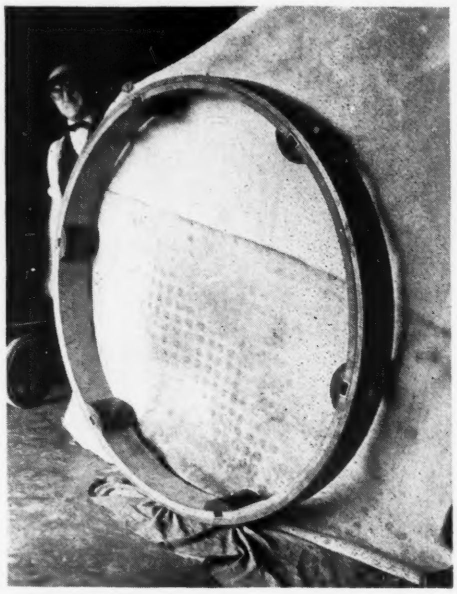
Mile after mile of pounding abrasion and friction from the roughest roads operate to wear out the automobile tire, and yet the average life of the best cord tires is well over 15,000 miles and many have been known to last for 50,000. It was while marveling at the exceptional ability of the rubber tire to resist wear that James J. Denny, former superintendent of the Nipissing Mines Co. at Cobalt, Ontario, Canada, conceived the idea of lining a tube mill with rubber. Liner consumption at Nipissing was high as the silver mineral being recovered was disseminated through an extremely hard and abrasive quartz. Frequent renewals of the lining were necessary and the cost, time and labor made the per ton costs very high.

The quality of rubber which allows it to resist abrasion to a remarkable degree, that is, its resilence and elasticity, made it very desirable as a liner for tube mills. Sharp rock particles coming in contact with the liner would imbed themselves in it without puncturing or wearing away the surface. A fancied difficulty was that a soft substance might prevent efficient grinding in the same manner that it offset wear. Naturally, rock particles caught between a steel ball or rod and a rubber lining would not be ground. This was considered a serious objection until it was conclusively proven that the actual grinding action, in a tube or rod mill, takes place between the balls or rods rather than between them and the liner. As the mill turns and the balls, in dropping by the force of gravity, tumble one over the other, the material which is to be ground is crushed or ground between them. Very little or no grinding actually takes place between the balls and the lining of the mill. Accordingly, the resistance to abrasion of a soft rubber liner would not effect the efficiency of the mill in grinding.



Short mill lined with "Linerite" for testing

With this objection removed, actual experiments were started with a small mill, 18 in. in diameter by 3 ft. long, with a parallel test running in a similar mill using an iron liner. Various compounds of rubber were used in this test and in those which followed until a special compound of unusually dense texture and extreme resistance to abrasion was developed. This is offered to operators under the trade name of "Linerite," an exclusive product of the B. F. Goodrich Rubber Co. of Akron, Ohio, who are licensed under the patent rights of the inventors.



Section showing smooth lining and method of fastening

The results of the first test were so encouraging that it was decided to partially line a mill, 4 ft. in diameter by 20 ft. long. Accordingly, the entire circumference of this mill was lined with the new rubber liner for a length of 3 ft., the remainder of the lining being of iron. A later test was then conducted by lining the entire mill, exclusive of the ends, with rubber. Results which had been previously compiled for the same mill with chilled iron liners were used for comparative purposes. The three tests proved beyond any question that the use of rubber as liner for tube mills was success-

ful. The following were the conclusions:

1. The change to rubber lining increased the capacity of the mill to make a finished minus 200-mesh product by at least 15%.

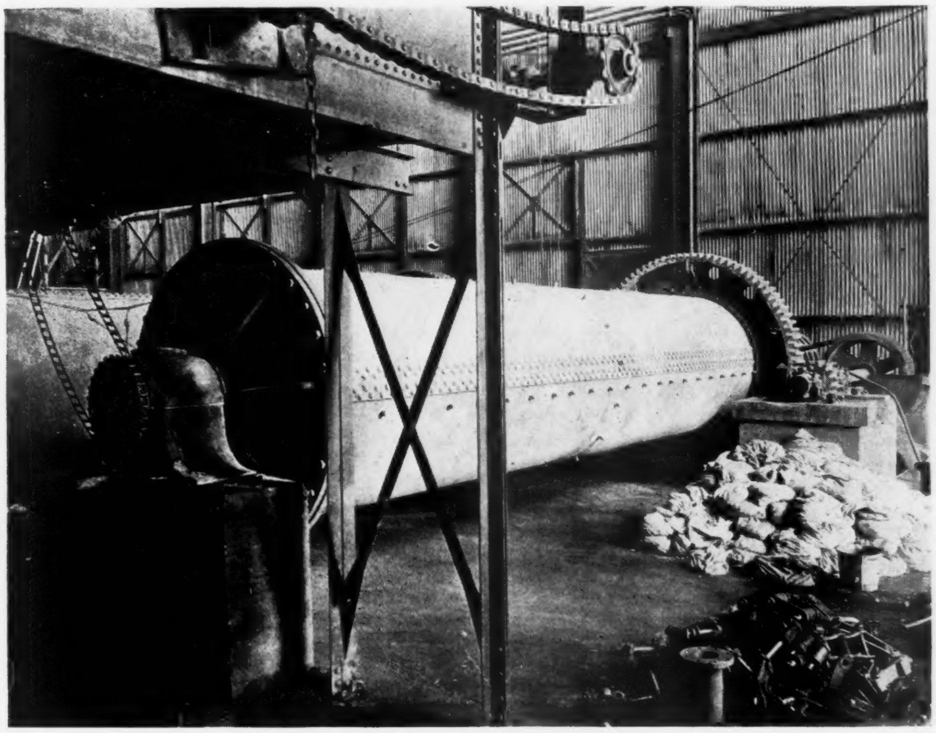
2. Two mills, lined with "Linerite," could do the work of three lined with iron.

3. The speed of a 4-ft. mill could be reduced to 28½ r. p. m. instead of 32 r. p. m. which is considered good practice with steel lining.

4. Continuous operation for three months showed a loss of only 2% by weight of the rubber lining.

5. The rubber lining gave a greatly increased grinding capacity to the mill.

The greatly increased efficiency of the rubber lining, Linerite, over steel is due in a large measure to the fact that the balls in contact with the liner are imbedded in it by the weight of the mass above, and thus slippage is arrested and the balls carried to a higher point in the mill. As a result, lost power, through slippage, is largely eliminated and a more efficient cascading attained.



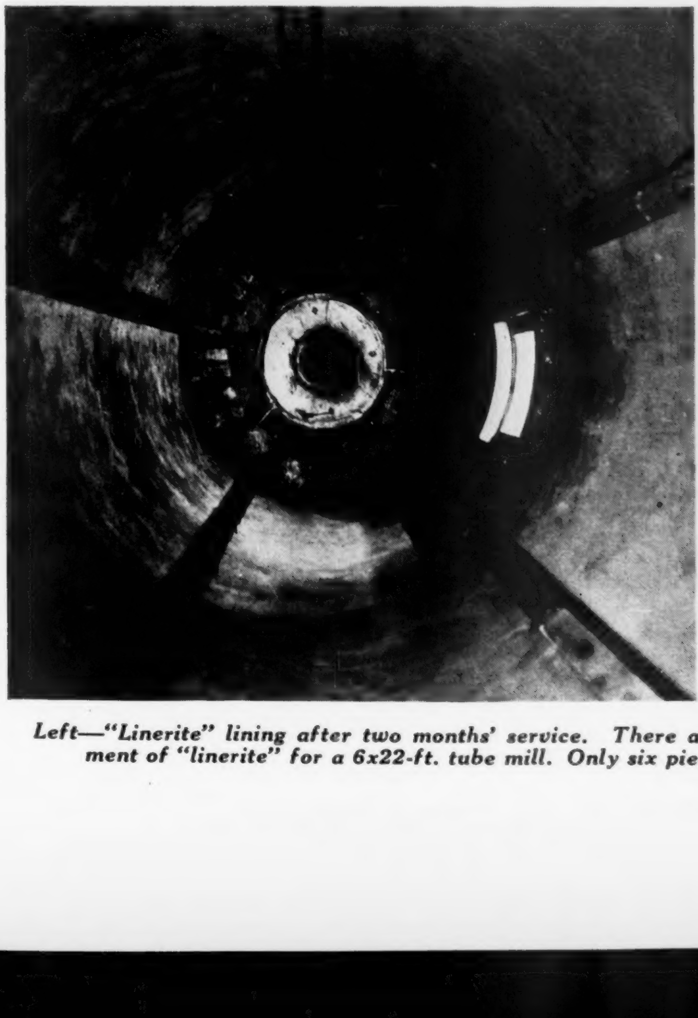
Mill now under test in cement plant as explained in the text. "Linerite" lining has greatly increased grinding capacity

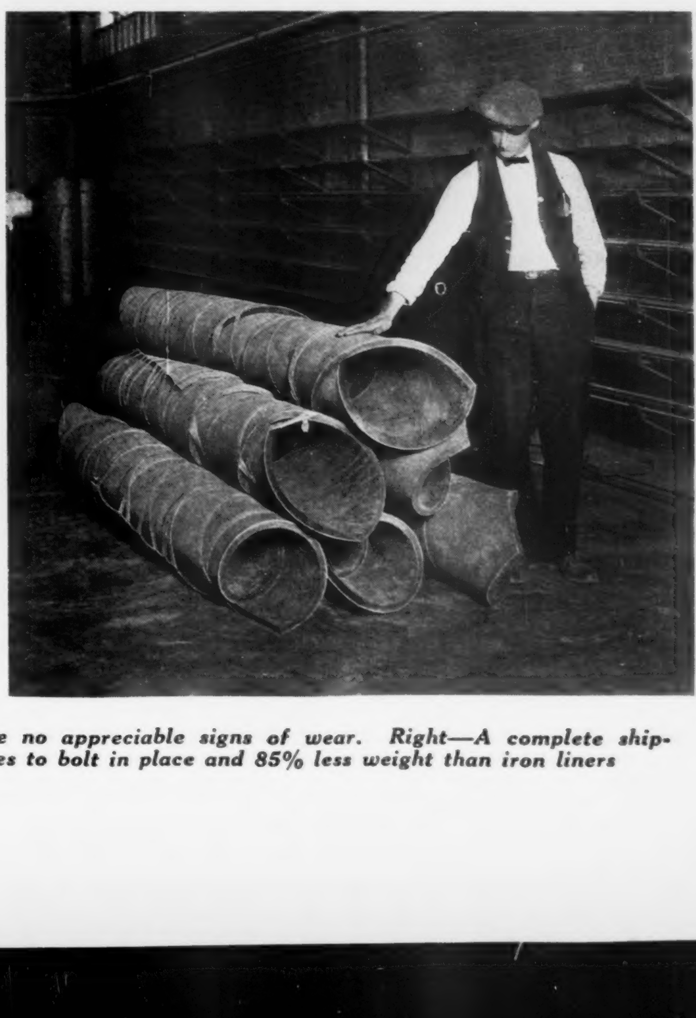
Later tests were conducted and improvements in the liner effected until loss of liner by wear has been reduced to less than 1.5% in three months.

In the cement industry, the Goodrich company is now conducting experiments which bid fair to show results eequal to those that have already proven Linerite a great economy in grinding practice for ore reduction. An installation has been made in a 5-ft. by 22-ft. Allis-Chalmers tube mill, carrying a grinding charge of 20,000 lb. of ⅞ in. cast iron balls, in a cement mill.

An interesting feature is presented in a comparison of the weight of the Linerite used in this mill with the weight of the steel liner that was previously used. The Linerite in this installation weighed 1800 lb. and was made up in six sections 1 in. thick. The steel retaining bars and bolts weighed approximately 2000 lb., which made a total weight for the complete lining of 3800 lb. The weight of the iron shell lining formerly required was 22,000 lb. The weight alone effects material economies, in that there are eight tons less to handle, transport, install and eight tons less weight on the bearings. The fact that there are only six pieces to bolt into place means reduced cost of labor and less time for a shut-down.

For over six weeks, Linerite has been in operation in this mill and the surface of the lining tells a remarkable story in corroboration of the wear-resisting powers of Linerite. During the curing operation of the Linerite slabs, a piece of fine cotton gauze was placed between the press and the wearing surface of the rubber, leaving a slight imprint of the cloth. Despite continuous operation since its installation, the wear on





Left—"Linerite" lining after two months' service. There are no appreciable signs of wear. Right—A complete shipment of "linerite" for a 6x22-ft. tube mill. Only six pieces to bolt in place and 85% less weight than iron liners

the surface of the Linerite has been so slight that the criss-cross marks of the gauze are still plainly discernible.

Power, in this mill, which was formerly wasted in grinding away thousands of pounds of liner and balls is now spent in effective crushing and pulverizing of stone. Instead of two-inch thick, heavy metal liners, they have a light weight material of resilient, yielding surface that is almost indestructible by comparison with the old. Although the tests are not yet completed, the following advantages are apparent at this early date, in the substitution of Linerite for steel liners:

1. Longer wear for the lining
2. 85% less dead weight.
3. Increased grinding capacity.
4. Decreased consumption of balls.
5. Lower power consumption per unit of material ground.
6. Lessened time and cost of installation.

Result of Tests

Arrangements are now being made for the installation of Linerite in other wet grinding mills in the cement industry. The results of the tests being made at this time, together with those contemplated or under way at present, are viewed with such optimism by the Goodrich Company that it is predicted that a reasonably short length of time Linerite will be adopted as the standard lining in wet grinding. Certainly, the tests that have already been conducted in the mining industry and the actual operation of Linerite in the mining fields points to the possibility of great savings in production costs through this new economy in grinding. Conditions in the cement industry, if any comparison can be made with those in mining, are if anything less severe; and a successful product for grinding abrasive ores should prove equally efficient in the grinding of softer stone.

Production and Distribution of Limestone in Germany in 1923*

Lime Production in Germany Half of United States Production in Spite of Lessened Activity in the Chemical Industries of the Country

PRODUCTION of limestone in Germany in 1923 amounted to 5,600,000 tons, or 55% of the 10,200,000 tons produced in 1922. Out of the 1923 production, 1,400,000 tons were sold raw (2,400,000 tons in 1922), while 4,200,000 tons were further processed in refining works (7,800,000 tons in 1922), according to the Limestone Union of Berlin.

Production in 1922 and 1923 respectively as follows:

	1922	1923
	Metric tons	
Quicklime	4,354,000	2,331,000
Including:		
White lime in lumps	2,800,000	1,547 000
Other lumps	777,000	353,000
Ground quicklime	777,000	431,000
Furthermore, the following was produced:		
Sinter dolomite	161,000	65,000
Marly limestone	689,000	445,000
Ground raw limestone	115,000	77,000

Production was divided among 280 works, employing 19,000 workers in 1923, against 633 works and 25,000 workmen in 1922. Reduced production in 1923 was caused by the uncertain economic situation, making it impossible for smaller concerns to operate. Furthermore, the Ruhr occupation affected production adversely; the Ruhr and Rhineland is credited with about 36% of Germany's total production of limestone.

Sales of Germany's limestone in 1923 showed marked decreases from the 1922 sales level, as indicated in the following table:

	1922	1923	Per cent Reduction from 1922
	In metric tons		
Quicklime	4,334,000	2.313,000	46.6
Sinter dolomite	167.000	65,000	61.1
Marly limestone	681.000	432,000	36.6
Ground raw limestone	111.000	74,000	33.3
Raw limestone	2,390.000	1,378,000	42.3

Virtually all of these quantities were consumed in Germany; insignificant export shipments were made to Holland and Denmark.

Inland sales were distributed among the following consuming groups in 1923:

Consuming group	Quicklime	Sinter dolomite	Marly limestone	Ground limestone	Raw limestone
	In metric tons				
Building trades	1,078.900	....	....	....	247,900
Iron and steel works	418,700	63,100	....	....	857,600
Agriculture	282,600	....	409.900	34,500	....
Calcium cyanamide manufacturing	159,300	....	....	....	300
Chemical industry	197,600	....	....	....	64.800
Sugar manufacturing	4,600	....	....	....	179,300
Calcerous sandstone	105,300	....	....	....	5,600
Alluvial building stone	17,500	....	100	....	....
Other consumers	28,200	100	20,600	38,900	22,000
Exports	20,000	1,300	2,700	800	100
Total	2,312 700	64,500	432,400	74,200	1,377.600

Compared with sales in 1922, it is observed that these were a great deal less to (1) the building trades, (2) iron and steel works and (3) agriculture, these being the chief consumers of limestone. The unfavorable economic situation, coupled with the Ruhr occupation, explains this decrease generally. Furthermore, in November, 1923, the introduction of high freight rates burdened the haul of limestone from works to consumers accordingly.

Consumption of quicklime, as represented by sales of only 2,312,700 tons in 1923, against 4,334,410 tons in 1922, declined especially.

*Submitted by Assistant Trade Commissioner W. T. Dougherty, Berlin, Germany, April 22, 1924.

Ask Cut in Cement Rates

HENRY C. HALE, chairman of the Interstate Commerce Commission, has closed a two-day hearing at Estes Park, Colo., from parties seeking lower rates on freight shipments from Middle Western cement mills.

Representatives of the Union Pacific, Chicago, Burlington & Quincy, the Denver & Rio Grande Western and Atchison, Topeka & Santa Fe railroads spent the day on the stand protesting the tariff cuts sought by the Colorado producers.

The Union Pacific system representatives came forward with a proposed plan to compensate the producers in event the commission's decision favors a tariff cut. The Denver & Rio Grande Western railroad attorneys also advanced a proposal for reduced rates that would cover shipments only from mills located in the Oklahoma and Kansas gas belts.—*Denver (Colo.) News.*

Kansas to Require Use of State Made Cement on State Work

WITH the object of fostering and encouraging Kansas industries, Governor Davis has directed T. J. O'Neil, state business manager, to require the use of Kansas-made cement in construction work under his supervision. The governor also asked the state highway engineer and state architect to make use of the Kansas product, pointing out that the state has seven cement mills.—*Leavenworth (Kan.) Times.*

Editorial Comment

Report of Car Loadings

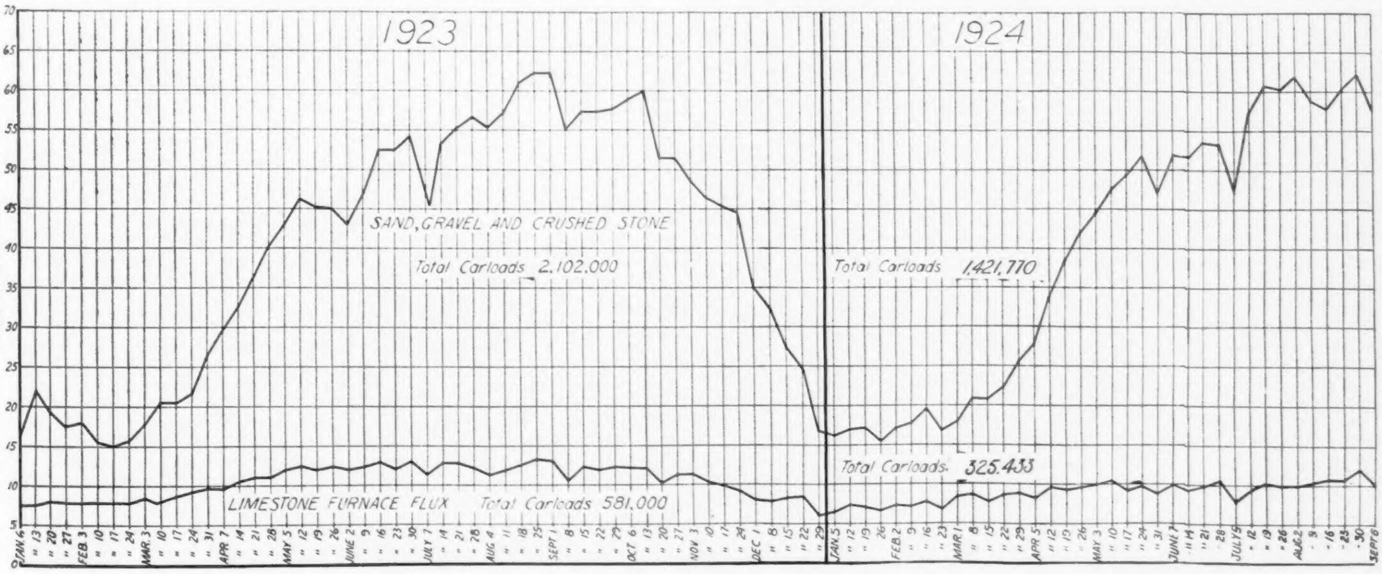
The car loading chart shows the regular drop that comes from the Labor Day holiday in the week of September 6. This drop is not so pronounced as it was last year, showing the effort made to keep up shipments even during the holiday period. There is a corresponding drop in the shipments of flux stone but the shipments of the previous week were the highest so far reported in 1924. These charts in connection with the report of cement production and shipments, given in the issue of September 20, show the exceedingly healthy state of these rock products industries, and consequently the industries which are dependent upon them.

Large Tonnage Plants

Elsewhere in this issue is noted the fact that one of the Columbia Quarry Co.'s plants, which burned recently, is to be rebuilt to have an output of 7000 tons per day of crushed stone. This is but one of several instances that show the tendency toward large tonnage plants for producing sand, gravel and crushed stone. It used to be thought that the production of such materials would be confined to comparatively small tonnage plants by freight rates, which would limit the area in which the product might be shipped. But it hasn't worked out that way. Plants have grown larger and the areas served by plants have not been determined so much by freight rates as some other considerations. Notable among these considerations is the quality of the product, for it is conclusively proven that purchasers will buy good material a long way from where it is to be used, and pay the heavy freight charges, rather than accept an inferior material produced near at hand. Another consideration is that of deliveries. It has been found that the purchaser will pay more freight for the sake of buying of a plant which can supply the material when and as it is needed than to take chances by buying of a plant with limited producing facilities that may not be able to make delivery as fast as the work demands. The editor-manager of ROCK PRODUCTS, who is now in the Eastern states, notes that the tendency in the lime business is the same as in the industries mentioned. Price is not the deciding feature of a purchase so much as the ability of the selling company to deliver a good product and to deliver it at such times and in such quantities as it is needed.

Ultimately Concrete!

A very interesting and instructive transformation is taking place in Kansas and other of the prairie states. Ten years ago this part of the country was famous (or infamous) to the traveler for its mud roads and "tin" bridges —remarkable structures often defying the laws of mechanics. A recent item in a Kansas newspaper from the city of McPherson reads: "L. H. Anderson and Arthur Rolander, of this city, operators of the Interlocking Cement Stave Silo Co., have just been awarded a contract by the Marion county commissioners to build 51 concrete bridges and culverts, which will be installed in connection with federal-aid road improvement in Marion county." Thus the world progresses from darkness to light.



The chart shows the regular drop in car loadings due to Labor Day, but the drop is not so marked as it was last year. Note that flux stone loadings are increasing steadily and reached their highest point this year in the week before Labor Day

Chert Is Unfit for Coarse Concrete Aggregate

THE *Engineering News Record* of August 28 contains an article by F. V. Reagel, of the Missouri State Highway Commission on the experience in that state with chert as a concrete aggregate. The chert referred to came from the Burlington limestone of the Mississippi system and appeared to be an excellent coarse aggregate material. Nothing had been published to show that it was not. But in the course of a short time an important concrete road built with chert aggregate was found to be disintegrating. Tests in the laboratory showed that concrete made with chert could be disintegrated by repeated freezing and thawing.

While chert is of limited occurrence the importance of this discovery is great as it is possible that chert might have been used in some important structure, such as a big bridge, with disastrous results.

The following account of the laboratory tests is from Mr. Reagel's article:

"Experiments tend to prove that the effect of freezing on chert is confined to material which has not had an opportunity to be resilicified. Gravel formed by stream acton from chert material has been subjected to the action of iron and silica compounds and in most locations in Missouri has been completely stained to a brown color. In all cases investigated the stained gravel successfully resisted attempts made to induce disintegration by freezing. The difference in resistance to freezing effects noted between crushed chert on one hand and crushed flint and stained chert gravel on the other is attributed by the writer in a large measure to the resilification of the flint and the chert gravel.

"The effects as observed on concrete containing chert aggregate are serious both as to the appearance and the strength of the work. Whenever a piece of the chert has a position in the concrete near enough to the surface to be readily subjected to the freezing and thawing action of a winter season, the resulting expansion ends in radiating cracks as well as spalling and the pop-outs mentioned. The final results is a considerable weakening of the concrete in pavement or structure. In case the entire coarse aggregate content of the concrete is the chert mentioned, a sufficient number of cycles of freezing and thawing will result in a virtually complete disintegration of the concrete as rapdly as the progressive disintegration exposes fresh surfaces of the structure to the weathering effects. The presence of small quantities of the chert in the coarse aggregate results in a varying amount of surface effect and strength reduction. The deleterious effect has been verified by both laboratory test and field observation and action has been taken by the Missouri Highway Department limiting the percentage of the objectionable material to 5 per cent of the coarse aggregate by volume.

"*Test Data*—Averages for 6x12-in. compression specimens and 4x6x24-in. transverse specimens broken with both 12- and 24-in. spans are given at 28-day and 90-day ages in Table 1. The mix used was a 1:2:3½, using a slump of ½ to 1 in. Cement and sand meeting the Missouri state highway specifications and passing standard tensile test requirements were used. The coarse aggregate was crushed chert. Some individual transverse specimens broke under their own weight and some compression specimens were so badly disintegrated that no compression test could be made after they had been subjected to five alternations of freezing and thawing. Specimens were not subjected to freezing until they had reached the ages indicated.

"All specimens were free from cracks and surface defects and showed comparatively smooth surfaces before freezing.

"In addition to the freezing tests made on concrete in which the chert was used as aggregate, samples of the chert itself were subjected to the same tests. It may be noted that the chert occurs in the rock formations in various stages of disintegration, varying from a hard dense gray chert, breaking with conchoidal fracture and sharp edges to a white or stained amorphous material which can be crumbled with the hands.

"The freezing tests were made on a number of samples covering varying stages of the disintegration, and it was found that all forms of the chert were very seriously affected by the freezing action. The chert which was in the more advanced stages of disintegration was the more seriously affected and would be the most objectionable in concrete."

TABLE I—COMPRESSIVE AND RUPTURE STRENGTH

	Compressive Strength 28-Day Lb. per Sq. In.	Compressive Strength 90-Day Lb. per Sq. In.
Compression (unfrozen	3507	5765
Compression (frozen five times)	1612	2870

Modulus of Rupture—28 Days

Unfrozen 12-in. Span	Unfrozen 24-in Span	Frozen 12-in. Span	Frozen 24-in. Span
810	886	**153**	**88**

Modulus of Rupture—90 Days

Unfrozen 12-in. Span	Unfrozen 24-in Span	Frozen 12-in. Span	Frozen 24-in. Span
1132	1032	190	**161**

New Crushed Slag Plant for Birmingham, Ala.

THE Sloss-Sheffield Steel and Iron Co., Birmingham, Ala., is starting the construction of a modern screening and crushing plant for slag at its city furnaces on First avenue and 32nd street.

This plant will produce all standard sizes for general construction, reinforced concrete, foundations and paving.

The plant will be prepared to make deliveries to railroad cars, street cars and trucks. It will be completed and in operation by October 1. The capacity will be 1000 tons of crushed and screened "Pyramid" slag.

The company is now taking care of local trade with a smaller plant.—*Dixie Manufacturer.*

Buffalo Slag Co.'s New Plant in Operation

THE new crushing and screening plant of the Buffalo Slag Co., located between the Adrian Blast Furnace and Falls Creek, Penn., is now in operation. This new plant is built of structural steel erected on slag concrete pier foundations and is equipped with modern crushing and screening machinery to prepare air-cooled blast furnace slag for use in concrete construction of all classes, macadam roads and railroad ballast.

The capacity of plant is rated at 90 tons of screened slag per hour or 17 carloads per day. Ten sizes of crushed slag are produced, ranging from those used in the manufacture of concrete blocks and in constructing concrete sidewalks, cellar walls and floors to sizes graded for railroad ballast, massive concrete and macadam highways.

The plant will operate about eight months each year and will serve customers during the winter months from storage piles accumulated during the operating season.

The slag company has a private roadway to its crushing plant and will load trucks in addition to carload shipments. The plant can be reached over good roads. G. S. Snyder is the local representative of the Buffalo Slag Co.—*Express, Du Bois, Penn.*

Laying Brick in Forms

THERE is no doubt that the high wages paid to brick layers have stimulated the use of concrete for the placing of which unskilled labor may be employed. Of late efforts have been made to reduce brick laying to a system adapted to the use of unskilled labor. One method in use in England employs forms with adjustable boards against which the bricks are laid. Even with the aid of forms it is hard to see how brick laying can be made as cheap and simple as the placing of mass concrete.

The Sand and Gravel Industry in Nebraska

IN a well-written review of the sand and gravel production of the state of Nebraska, the *Lincoln Star* says in part:

Millions of tons of sand and gravel are dredged from the banks along the Platte each year—about thirty tons of sand to every square mile in the state. Because of freight charges, a great part of this is consumed within the state, but much is shipped into western Iowa, where there are no deposits available this side of Des Moines.

Practically all of the industry in Nebraska is confined to the Platte river. A few dry pits are worked, but because the material obtained there always contains more or less clay, it is considered lower in grade than that from the river.

Because of its geographic position, the Platte river region is excellently supplied with railroad facilities. Union Pacific, Missouri Pacific, Burlington, Rock Island and North Western lines unite in giving service to the sand dredging companies.

Much of the product is used for highway surfacing, and some in concrete highways, but by far the greatest demand is found in Omaha and Lincoln.

All the smaller towns in the state must be supplied, however, so that, to save freight charges, the sand companies have spread out their workings over a long stretch of the river. Instead of working a few large outfits, the Lyman Ritchey Co. of Omaha, one of the largest, has a number scattered from the mouth to the source of the river. It owns sand pits almost to the western border of the state.

The Moffit Sand Co., headed by A. W. Moffit, has its headquarters in Lincoln. It operates two outfits. The Hadley-Davis company also operates two outfits.

The cost of getting sand and gravel from the river bottom is about 40 cents a ton. Yet, fine sands are sold at 30 cents a ton. There is such an overproduction of this grade, that it is often counted as a waste product. Anything which the producers can get for it is practically clear.

The sand in the Platte is not native to Nebraska, but originally came from the mountains and bad lands of the west. A good share of it came from Wyoming, where but small quantities are now produced. It is deposited in "aluvial fans," at points from one end of the river to the other. These formations are very much like deltas at the mouths of rivers.

A score of outfits are now operating steadily on a large scale along the Platte, besides the hundreds of smaller ones with poorer facilities which operate intermittently. There are plants at Valley, Grand Island, Kearney, Lexington Overton, Alis, Ashland, Meadow, Roosevelt, North Bend, Schuyler, Columbus and Central City.

Rates Cut on Montgomery, Ala., Sand and Gravel

REDUCED rate of $1.62 per ton on sand and gravel, carloads, from Montgomery, Jackson's Lake, Prattville Junction, Coosada, Oktamulke and Prattville to Florence, Sheffield and Tuscumbia has been ordered by the public service commission on the L. & N., Southern & Northern Alabama railroads.

Present rates on sand and gravel, carloads, except the rate on sand through Birmingham in connection with the Southern & Northern Alabama railways from the points named to Florence, Sheffield and Tuscumbia, are found unjust, and a rate of $1.62 per ton of 2000 lb. is prescribed for the future.

The Southern & Northern Alamaba railways are authorized to increase the rate on sand from Birmingham and group points to Florence and Tuscumbia to the level of those to Sheffield.

Iowa Gets Reports as a Basis for Sand and Gravel Tax

THE state executive council of Iowa is now collecting reports from sand and gravel concerns as to the tonnage of gravel and sand they have taken from Iowa streams since they started pumping sand this spring. These reports will be made the basis for the tax required of these concerns.

Sand and gravel used for public improvements has been exempted from the tax by a resolution passed by the legislature until February 1, 1925.

It is possible that the coming legislature may make some changes in the sand and gravel law in the tax per ton.—*Davenport (Iowa) Times.*

New Arkansas Sand and Gravel Plant

THE Williams-Laflin Sand and Gravel Co., with Arkansas headquarters at Texarkana, has begun excavation work on a gravel pit at De Queen, Ark.

Frank Rogers surveyed the site of the pit and the pond which is to furnish water for washing the gravel. Mr. Rogers is doing the field work for the undertaking, while E. S. Byington is acting as consulting engineer. Superintendent William M. Shane and Chester S. Williams of Texarkana were looking over the ground recently. The site covers about 100 acres of ground. Machines for washing the gravel will be erected and the plant is expected to be in operation by the first of November.

The plant will be about 65 ft. in height. The cost of the gravel washing machines will be between $35,000 and $40,000. When operation is begun an average of 20 cars of gravel is expected to be shipped per day of 10 hours.

The pond, which is to measure approximately 800 ft. in length and 600 in breadth, will hold 14,000,000 gallons of water. It is to be made by the construction of a dam, probably concrete, across Little Bear creek. The dam will be 14 ft. in height and is expected to cost approximately $2500.

The Kansas City Southern railroad will build a siding on the property. The spur will have room for 26 cars, and will be known as the Wilaco Spur.

The offices of the Williams-Laflin Sand and Gravel Co. will be in the Texarkana National Bank building of Texarkana. The officers of the company are: Chester S. Williams, president; Judge A. D. Keeney, vice-president; Don C. Laflin, secretary and treasurer, and William M. Shane, superintendent.—*De Queen (Ark.) Bee.*

Sand and Gravel Association to Hold Convention at the Auditorium Hotel

THE National Sand and Gravel Association sends out the word that its forthcoming convention is to be held at the Auditorium hotel in Chicago and not at the La Salle hotel, as previously stated.

The convention is to be held January 5, 6 and 7, 1925, at the same time as the Good Roads Show. Members are advised to make reservations early, as Chicago hotels are always crowded the week of the Good Roads Show.

Jahncke Gravel Plant Has Heavy Fire Loss

THE gravel plant of the Jahncke Service, Inc., at Roseland, La., has suffered a damage of approximately $50,000 by fire of unascertained origin. One section of the plant was badly damaged, but there was little interference with the plant's operation, production being resumed after 48 hours.—*New Orleans State.*

Another Sand and Gravel Plant for Missouri

THE *Warsaw (Mo.) Enterprise* says that a sand and gravel plant is to be built at Warsaw by F. E. Ross of Jefferson City and T. W. McKee of Windsor, Mo. It is expected that the plant will be in operation on the first of the year. Its output will be largely used on state highways. The capacity is expected to be 10 cars per day for the season.

Batesville White Lime Co.'s New Plant Progressing

THE development of a large body of Boone limestone near this place by the Batesville White Lime Co., is causing a new town to spring up on the Cushman branch of the Missouri Pacific, two miles east of Bethseda, Ark., where a plant to manufacture all kinds of lime products is being erected. The name of the town is Limedale, taking its name from the industry which brought it into existence.

According to several Arkansas local papers, the new plant, quarry and industrial railroad represents an investment of $200,000, and is the largest development ever started in the Upper White river country. Next to the Remmel dam it is the largest piece of work in progress in Arkansas.

The construction of this plant and the opening of the quarry is the result of two years research work by the company. Two years ago the company set out to find a stone that would burn a pure white lime. Experts prospected every large body of limestone in the north half of the state before settling on the present deposit. Even after they found the stone they conducted quantity and quality tests for months. They burned lime from all parts of the deposit and laboratory tests showed 99.34 calcium oxide, a higher grade lime than is burned in any other state. Work on the big plant started in the spring and it is over half completed at this time. The company expects to start production sometime late in November or early in December.

The quarry will be a half a mile long and have a face of approximately 30 ft. high when opened up. It will be connected with the kilns and plant, at Limedale, by a narrow gage railroad. Stone will be handled in two-ton steel cars transported by gasoline locomotives. Two hundred and fifty tons of stone will be moved each day.

The plant at Limedale will be one of the largest and most modern in the South. It will consist of three direct flame shaft kilns, with a capacity of 600 barrels a day, and a hydrating plant, the latter the second of its kind in the state. After the stone is loaded on the cars at the quarry, the rest of the operation will be mechanical. The concern will employ about 60 men.

To Study Reinforcing in Concrete Roads

THE details of plan and procedure to be followed in the investigation of the economic value of reinforcement in concrete roads, being undertaken by the Highway Research Board of the National Research Council, are now completed and field examinations are about to commence. Director Chas. M. Upham reports that the various state highway commissions will actively cooperate with the board in conducting this investigation. Except in cases of actual failure, inspections will concern principally pavements having had at least five years of service, a great number of which are located in the states such as New Jersey, Ohio, New York, Pennsylvania, Delaware, Wayne county, Michigan, Milwaukee county, Wisconsin, Iowa, Illinois and California.

In this intensive study an effort will be made to determine from a survey of existing roads; the influence of steel reinforcement on the resistance of the slab to traffic, subgrade and climatic conditions; the conditions under which steel reinforcement is especially beneficial to concrete slabs; the effect of slab design on the efficiency of reinforcement, and finally, the relative cost of plain and of reinforced concrete roads, considering the initial investment and the annual maintenance and renewal charges.

The preliminary work of assembling data now available will soon be completed, at which time the field inspections will begin. The itinerary will be made out after further study, but it is proposed to pursue the investigation in the northern sections until cold weather, when attention will be turned to the southern locations. It is expected that a progress report will be ready for the annual meeting of the Advisory Board on Highway Research to be held at the National Research Council building Dec. 4 and 5.

Cement Rate Is Attacked

COMPLAINT has been filed with the State Department of Public Works against the Milwaukee and the Northern Pacific railways by W. F. Jahn and Co. of Seattle, large dealers and importers, attacking the freight rate on cement between Seattle and Yakima and intermediate points, as being excessive and unreasonable.

The company points out that the rate on hay between Seattle and Yakima is but 18 cents per 100, which would bring about $36 per car, as against 21½ cents per 100 on cement or about $86 per car.—*Seattle (Wash.) Times.*

Certain-teed Products Corporation Refinancing

DIRECTORS of the Certain-teed Products Corporation, manufacturers of building material, have called a special meeting of stockholders for September 30 to authorize the issuance of 340,000 shares of no par common stock to be sold at not less than $40 a share. An increase in the number of authorized common shares from 150,000 to 500,000 was voted last year. The action was taken to prepare a way for retirement of bonds and preferred stock.—*Columbus (Ohio) Journal.*

Cement Company Calls Bonds

ANNOUNCEMENT was made today of the action of the board of directors of the Missouri Portland Cement Co., September 16, calling in their 6½% serial bonds, maturing in 1929, 1930, 1931 and 1932. These bonds are for $491,000, and will be taken up, as of January 1, 1925, at 105 and interest.

H. L. Block, president of the corporation, said that the board of directors justified the action because of cheap money rates and satisfactory business conditions. This also explained, in his opinion, the rise in stock, which a year ago, was quoted around $85 and was this week bid at $133. The bonded indebtedness of the company September 1, was $1,777,500.—*St. Louis Post-Dispatch.*

Lime Sold in 1923

THE lime sold in the United States in 1923, as recorded by the Geological Survey, Department of the Interior, amounted to 4,069,830 short tons, valued at $39,934,707, an increase of 12% in quantity and 20% in value over 1922. Lime sold for construction work increased 15.5%, that sold for chemical use 16%, and that sold for liming land decreased 14%. Hydrated lime, which is included in the total given, increased 10%. The table shows sales by uses in 1922 and 1923.

LIME SOLD IN THE UNITED STATES IN 1922 AND 1923 BY USES

	1922		1923	
Use—	Short tons	Value	Short tons	Value
Agricultural	272,726	$ 2,005,082	234,138	$ 1,766.574
Building	1,845,208	18,463,825	2,131,533	22,521,628
Chemical:				
Glass works	62,187	$ 463,628	78,942	$ 676,291
Metallurgy	200,799	1,458,553	373,020	3,044,383
Paper mills	310,229	2,683,487	311,309	2,768,909
Refractory lime (dead-burned dolomite)	348,838	2,813,946	357.642	3,599,126
Sugar refineries	16,393	197,878	13,044	164,039
Tanneries	42,978	420,148	53,906	523,994
Other uses	485,441	4,172,420	516,296	4,869,763
Total chemical	1,466,865	$12,210,060	1,704,159	$15,646,505
Sold to dealers (uses unknown)	54,818	576,072	....	....
	3,639,617	$33,255,039	4,069,830	$39,934,707
Hydrated lime (included in totals)	1,106,063	9,868,980	1,219.515	12,170,653

Rock Products in Quebec in 1923

ACCORDING to a Canadian correspondent, the following was the production of rock products in the province of Quebec in 1923:

	No. Workmen	Wages	Quantity	Value, 1923
Cement, barrels	670	$284,039	3,173,993 bbls.	$6,347,986
Lime, tons	216	200 281	72,289 tons	574,741
Limestone, tons	1,429	997,129	1,174,503 tons	1,976,665
Sand, building, tons	212	154,609	1,340,970	453,382
Granite	456	435,207	....	659,411
Marble, tons	107	121,980	2,170	197,555
Sandstone, tons	148	50,019	78,234	90,760
Slate	21	9,471	1,836	17,289

New Rock Crushing Plant Being Built at Elmwood, Wis.

THE installation of equipment for the new rock-crushing plant at Elmwood, Wis., for the Wissota Sand and Gravel Co. is proceeding rapidly. The spur track from the main line to the site of the new plant has been completely rebuilt with new ties and 90-pound steel. A well has been drilled and a high-pressure water system is now being installed.

Tilseth & Ofstie of Menomonie have completed the contract for stripping earth and clay from the top of the ledge so that the drilling for blast holes is expected to be well under way by October 1. The blast holes are being drilled so that upwards of 35,000 tons of rock will be loosened with one shot.

W. A. Rowe, manager of the company, is rushing the work to completion as he hopes to have the plant ready to supply agricultural limestone for the early winter trade. Mr. Rowe stated that after a thorough study of methods used in older sections of the east, it had been found that the most economical results for the use of limestone on farm lands had been obtained by using a product ground almost as fine as cement and free from lumps. The Wissota company is putting in pulverizing machinery to obtain desired results.

The field representative for the company, P. D. Southworth, has just returned from a month's trip visiting rock reduction plants and observing methods in Ohio, Pennsylvania, New York and New Jersey; also inspecting and purchasing machinery at Allentown, Philadelphia and New York.

One crusher alone weighs 30,000 lb. and will take in rock cubes up to a foot and one-half thick.—*Eau Claire (Wis.) Leader.*

Ford's Railroad Seeks to Condemn Quarry Land Near Lima

LAND condemnation suits, naming the National Quarries Co. of Lima, Ohio, Joshua G. and Lulu Bible and others as defendants, were filed in probate court recently in furtherance of plans of the Detroit, Toledo & Ironton railroad for establishment of yards and terminals north of Lima.

The land involved comprises about 11 acres owned by the quarries company and slightly more than 14 acres owned by the Bibles.

Officials of the National Quarries Co. will resist the action to the limit, it was learned. The concern owns a tract of about 48 acres which is to be quarried.

West of the present right of way the National Quarries Co. has a large quarry from which rock has been taken for years. A tunnel under the railroad and Boose road connects the pit with the new workings on the east side.

Because the tract is much more valuable than ordinary farming land, negotiations have been deadlocked. Land owned by Bible to the south is also considered valuable for quarry purposes.

After the quarries company is said to have refused to trade the land sought by the railroad for a 193-acre stone tract, directors of the Ford line, according to the petition, voted to bring suit.

The action, court officials say, is the largest and promises to be the most bitterly contested land condemnation proceeding in the history of the county.—*Lima (Ohio) News.*

New Quarry Near Lancaster, Penn., Opened

A NEW quarry is being opened on the property owned by Geiger Bros. of Quarryville, near Lancaster, Penn., for the purpose of taking out and crushing stone for the new state highway being built in the southern end of the county. The quality of the stone, after being tested by the highway department, is pronounced first class for road building.

In connection with the Geiger's in the operation of this new quarry is A. H. Burkholder of the Quarryville Lime and Stone Co.—*Lancaster (Penn.) News-Era.*

American Oolitic Stone Co.'s Plant Resumes Under New Ownership

THE American Oolitic Stone Co. plant at Bloomington, Ind., now owned by the Clear Creek Stone Co., has resumed operation.

Joseph Dalton, who has been appointed superintendent by the new management, was superintendent when it was owned by the American Oolitic Co., which went into the hands of a receiver. The Clear Creek Co., controlled by Detroit men and William Graham, purchased the plant several days ago.—*Bloomington (Ind.) World.*

Minimum Specifications for Highway Engineering Positions

THIS is a bulletin (May, 1924) issued by the National Research Council of the American Academy of Sciences, Washington, D. C. It gives just what its name implies, the things a person must be able to do, what he must know and the personal characteristics he must have in order to function in the positions described. These positions are such as rodman, instrument man, resident engineer, etc. The bulletin is sold by the National Research Council, but the price is not stated.

Grant County, Indiana, Farms Need Much Limestone

GRANT county farmers who want limestone for use next spring will find it necessary to order their supply now since most of the limestone quarries close down in the winter and do not open again until April or May. As a result, many alfalfa fields go without the needed limestone.

From one to four tons of limestone were needed in each case where the soil was tested for acidity, according to H. E. Schroeder, county agent. Limestone can be obtained in Grant county at a cost of from $1.75 to $2.50 per ton.

Even though the spring seedings of alfalfa have made a good growth, the damage from winter killing will be great where the soil is in need of limestone, the county agent stated.

Mr. Schroeder will be glad to test samples of soil for acidity, for farmers who are in doubt as to whether or not their soil needs limestone.

Iowa Farmers Urged to Buy Agstone Early

THE Marshall county, Iowa, Farm Bureau Association is prepared to assist farmers of the county to secure limestone and calls attention to the closing of quarries soon for the winter months. The quarries will not resume operations until next April.

Farmers are asked to order in carload lots. Where the individual can not use a carload he should arrange with neighbors and place a joint order.

A price of 60 cents a ton has been made to Marshall county farmers by the LeGrand Stone Co. for agricultural limestone. This is most economical, as the freight charges to Marshall county points are low.—*Marshalltown (Iowa) Times.*

Reported That Indiana Is Threatened with Car Shortage

THE trade in Indianapolis is somewhat anxious concerning the car situation in Indiana. A car shortage in 60 or 90 days may confront the industries of the state, according to a bulletin just sent out by the Indiana State Chamber of Commerce, unless there is immediate and active cooperation of shippers in the state. This shortage, officials of the chamber say, will be due to the demand for freight cars in moving the grain and potato crop of Wisconsin, Minnesota, North Dakota, South Dakota and Montana and also due to a heavy movement of cement from plants in Ohio and Indiana. The beginning of a heavy movement of coal also is under way. Indiana shippers are urged to help in the movement of cars by loading and unloading their shipments promptly and locating cars, wherever possible, destined to the railroads to which they belong.

Carbon Limestone Co.'s Plant Destroyed by Fire

THE Carbon Limestone Co.'s road-stone plant and agricultural-stone plant at Hillsville, Penn., were completely destroyed on Monday afternoon, September 22, by fire of undetermined origin, first discovered in the agstone plant. All machinery and equipment was completely ruined, entailing a loss of approximately $200,000, practically fully covered by insurance.

According to spectators, the blaze was spectacular, flames mounting more than a hundred feet skyward. In addition to the company's own well-organized fire brigade, the fire departments of Louisville, Ohio, and East Youngstown, Ohio, responded to the call, but little headway could be made in checking the blaze because of a fierce high wind. Dynamite was used to stop the spread of flames to the other buildings about the plant proper.

Grinding mills, sacking equipment, crushers, motors, conveyors and a large stock of paper bags were part of the toll. The roadstone plant had a capacity of 2000 tons per day. The task of clearing away the debris has already been accomplished and reconstruction started. According to Fred O. Earnshaw, general manager, a new roadstone plant will be in operation in time to take care of the company's spring orders.

J. C. King, manager of sales, writes us from the Youngstown, Ohio, office that, "The agstone plant should be in shape to make material within 60 days, for, notwithstanding the fact that our stockhouse was entirely destroyed, we can arrange to grind and load direct into the cars as soon as motors, bagging machines, and belting can be replaced."

In reconstructing, the company aims to make the new plants as nearly fireproof as possible, using concrete and steel throughout.

Both plants had been working day and night, working about 200 men. Practically none of the employes will be thrown out of work, due to the continued operation of other departments. But there will be a considerable loss to the business, as the plant had orders for the full plant capacity when the fire occurred.

New Columbia Quarry Co.'s Plant at Krause to Have 7000 Tons Output

THE *Advertiser* published at Greenville, Ill., quotes E. J. Krause of the Columbia Quarry Co. to the effect that the plant recently burned at No. 1 quarry at Krause, Ill., is to be rebuilt at once. The new plant is to have an output of 7000 tons per day, which will make it one of the largest in the country. It is to be all steel construction and electrically driven. The same paper is authority for the statement that the company has purchased additional acreage adjoining the quarry which contains sufficient rock to keep the new plant in stone for the next 25 years.

United States Gypsum Company Rebuilds Its Ft. Dodge Sheetrock Plant

THE United States Gypsum Co. has just finished completely rebuilding the Sheetrock wallboard unit of its plant at Fort Dodge, Iowa, increasing its capacity to 225,000 ft. a day and making this plant one of the three largest gypsum-working establishments in the world. This construction cost $150,000 and provides for further expansion up to a daily capacity of 50,000 ft. more than the plant had before this year.

Authority for this operation was issued late in May. The Fort Dodge plant serves all the Northwestern states and the increase of its capacity was necessitated by the growing demand for fireproof gypsum wallboard in that territory. The authority called for complete remodeling and reconstruction of the Sheetrock building, installation of a sprinkler system, substitution of a new continuous kiln for the old tunnel-drive kiln and entire rebuilding of the Sheetrock machine.

These changes were effected, without interruption to operation of the old plant, within four months after issuance of the authority. The wallboard machine was designed and built by the company and embodies all the improvements developed in its six other Sheetrock mills. On the first day of operation it produced within 5000 ft. of its total capacity. This is the fourth considerable construction done by this company in 1924.

Smith Stone Company Plans to Double Quarry Output

DOUBLING the capacity of the Smith stone quarry, said to be the largest quarry on Lake Michigan, and closing contracts for several new self-unloaders for Canadian boats, as well as purchasing another stone carrier as large as the Fontana, will probably be the result of a trip taken recently by L. D. Smith, president of the Leathem D. Smith Stone Co.

Mr. Smith returned recently from points in Michigan, principally Detroit, New York state, and the province of Ontario, accompanied by A. E. R. Schneider, marine manager of the Cleveland-Cliffs Iron Co., where he made a survey of the stone and lake transportation business.

The demand at Detroit alone for Sturgeon Bay hard stone, reports Mr. Smith, is becoming greater until there is now enough business there alone to exceed the present capacity of the quarry at Sturgeon Bay.

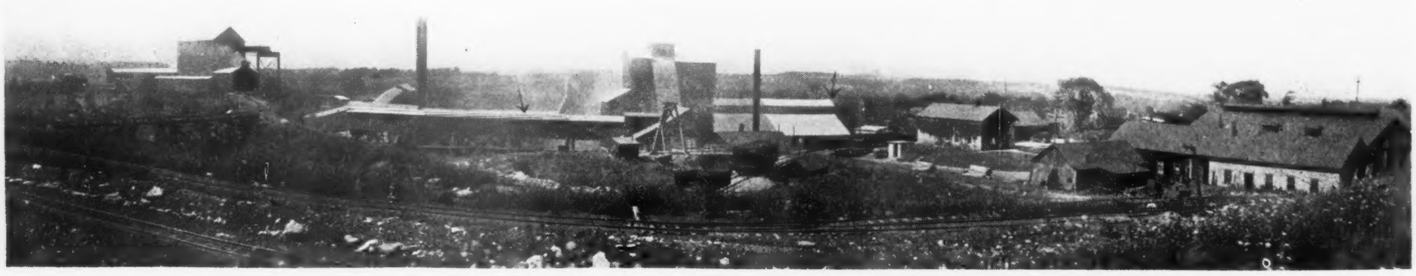
Plans are being made to increase the capacity of the local quarry to double its present production in order to take care of the increased trade, and to add to the stone carrying fleet another 6000-ton steamer like the Fontana equipped with the Smith self-unloading device which is said to have proved efficient in its use this season.

Canadians, who have a veritable monopoly on the carrying trade over Lake Ontario and the St. Lawrence river, have become interested in Mr. Smith's invention, and prospects of several contracts for the device are in view at Canadian ship yards where the two men visited during the trip in that region.—*Advocate, Sturgeon Bay, Wis.*

City Claims That Sewer Was Injured by Quarry Blasting

THE city council of Greensburg, Ind., has decided by unanimous vote to instruct the city attorney to bring suit at once for $10,000 damages and to institute proceedings to enjoin or legally prohibit further blasting in close proximity to the city sewer.

The quarry in which the blasting occurred is located on the ground of George Menzie, south of the city limits, and is operated by Carl E. Brown, who owns the plant and has the land leased. It is thought that the suit will be compromised.—*Greensburg (Ind.) News.*



Panorama of the Carbon Limestone Co.'s plant at Hillsville, Penn., which was badly damaged by fire recently. The portion of the picture between the two arrows shows that part of the plant which was entirely destroyed

New California Cement Company

According to reports received recently, The American Portland Cement Co. has been granted a permit from the commissioner of corporations to do business in California. A group of prominent Los Angeles and Hollywood business men are organizers of the company, which is capitalized at $3,000,000, composed of 3,000,000 shares, all common stock. According to the plans of the company, the holdings of the company will be developed into one of the largest cement plants in the west. Consisting of 1140 acres of land located in Imperial County, Calif., these holdings are known as the "Toltec Group of Claims," and are 2½ miles from Coyote Wells, on the main line of the San Diego and Arizona railroad, and are also on the California paved highway which connects San Diego with the Imperial Valley. The plant to manufacture cement will be built at either National City, El Centro or Coyote Wells, as each of these places presents excellent transportation facilities.

As soon as the exact location can be decided, the company will build the first unit of 1500 barrels capacity. Other units will be added as the demand for them increases. Portland cement and other products will be manufactured in the new plant.

The officers of the company include W. L. Peck, president; H. T. Lucas, vice-president; C. E. Merryweather, secretary, and S. C. Ulmer, treasurer. Mr. Peck will act as general manager. In addition to the officers, O. T. Deal, William H. Hopper, E. P. Donnelly, David Shepherd and H. B. Long will be on the board of directors.

Argue Cement Rates to Texas Points

Representatives of Texas cement companies and railway carriers offered opposing arguments and testimony on cement rates from Oklahoma, Kansas and Colorado to Texas points in a rate hearing which opened at Hotel Galvez before John T. Money, examiner of the interstate commerce commission, recently.

The companies hold that the rates are out of proportion with intrastate rates and discriminating against mills outside the state. The defense, presented through the carriers, takes the position that change in rates would decrease revenues.

About 40 representatives of mills and carriers attended the hearing. The meeting is a continuation of one begun in Denver in March.

Opening testimony was offered by E. W. Martindell of Denver, traffic expert representing the cement interests of Colorado. Representatives of Kansas and Oklahoma mills and carriers were heard. Mills of Oklahoma, Kansas and Colorado are interested in the cases.

Texas cement mills are represented by C. Lassiter of El Paso, U. S. Pawkett of San Antonio, R. C. Fullbright, G. G. Tomlinson and T. C. Taylor of Dallas, and F. C. Taylor of New York. B. L. Glover represents Kansas mills. E. L. Billingsley of Dallas, assistant general freight agent of the Texas & Pacific Railway, is chairman of the defense committee.—*Galveston (Texas) News.*

Pacific Portland Cement Company Dismantles Mound House Plant

The dismantling and removal of the Pacific Portland Cement Co.'s plant at Mound House, Nev., has been completed and the last carload of machinery and equipment that was used in the plant shipped away. Thirty railroad cars were required to effect the removal, part of the plant being sent to Gerlach and the remainder to other points where the company has plants.

A number of houses belonging to the company at Mound House have been temporarily abandoned after being stripped of their doors and windows.

Although large mining and milling operations at Mound House have been discontinued, the company will keep a small force of men at work there until it has removed some surface deposits of gypsite that will be handled with scrapers. These deposits will be shipped to other plants for treatment.

Hereafter the Nevada operations of the company will be carried on at Gerlach, where the company recently erected a large mill.—*Reno Gazette.*

Cement Company Will Install Mile Long Conveyor

Announcement has been made by Gordon Tongue of the Superior Portland Cement Co. recently that bids would be received at the company offices in the Seaboard building for the construction of the upper terminal and rock storage bins for what will eventually be a one-mile belt conveyor, estimated to cost approximately $200,000. The conveyor will serve the big cement plant at Concrete, Wash., and will be the largest structure of its kind in the Northwest.

Later bid calls will be issued by the company for other units of the big tramway planned by Plant Superintendent C. L. Wagner at Concrete, Wash.—*Seattle Journal of Commerce.*

Miami Sand and Rock Company Adds Equipment

According to local papers, the Miami (Fla.) Sand and Rock Co. is building a stern wheel boat for transporting sand and rock. The papers also say this is the first commercial boat to be built with stern wheel propulsion in the waters near Miami.

Washington Is Not Overcharged for Cement

The September 20 issue of Rock Products contained an extract from the speech of a candidate for governor in the state of Washington in which the candidate said that Washington paid a higher price than any other state for cement and was "in the grip of the four local portland cement factories." Rock Products is pleased to note that local papers have not been fooled by the candidate's statements, as the following editorial from the *Seattle Journal of Commerce* shows:

UNFOUNDED CHARGES

In the recent primary campaign certain candidates for nomination made charges to the effect that the state of Washington and the city of Seattle were being overcharged for portland cement. The charges are groundless and possibly have conveyed a false impression to many.

The United States Department of Commerce, through its division of building and housing, has issued a report as of August 1, 1924, which shows the average price paid by contractors for building material on the job in 46 leading cities of the United States.

The price of cement in Seattle is, according to the department's figures, less than the average price in the 46 cities listed. The price in Seattle is shown to be $3 a barrel—the average price in the cities referred to is $3.03 per barrel. And the Seattle price includes a freight charge of slightly over 30 cents a barrel.

City officials and state highway men at Olympia report that cement manufacturers sell to them direct at a price of $2.35 per barrel. The facts are that Seattle and the state of Washington are not overcharged, and such unfounded accusations of politicians are detrimental to an industry that is giving much to the state and one not deserving of such decidedly unfair treatment.

The Largest Cement Kiln

What is said to be the largest cement kiln yet built is being installed in the new plant of the Trinity Portland Cement Co. at Fort Worth, Texas. It is 250 ft. long and 11 ft. 3 in. in diameter. Other kilns which approach this in size are, one in the plant of the Great Western Portland Cement Co. at Mildred, Kan., 240 ft. long and 11 ft. in diameter, and one in the Indidiana Portland Cement Co.'s plant at Greencastle, Ind., which is 240 ft. long and 10 ft. in diameter.

Reported Work Is to Begin on Phoenix, Ariz., Cement Plant

Announcement has been made that the long-delayed construction of a cement plant at Phoenix, Ariz., would be started at an early date by the Riverside Portland Cement Co. of California. The corporation has a site for its plant on the north side of Salt River, about midway between Phoenix and Tempe. It is stated that $4,000,000 will be expended on the plant.—*Los Angeles Times.*

The Rock Products Market

Wholesale Prices of Crushed Stone

Prices given are per ton, F. O. B., at producing plant or nearest shipping point

Crushed Limestone

City or shipping point	Screenings, ¼ inch down	½ inch and less	¾ inch and less	1½ inch and less	2½ inch and less	3 inch and larger
EASTERN:						
Buffalo, N. Y.	1.30 per net ton all sizes					
Chaumont, N. Y.	1.00		1.75	1.50	1.50	1.50
Cobleskill, N. Y.	1.35	1.35	1.25	1.25	1.25	
Coldwater, N. Y.	1.50 per net ton all sizes					
Columbia, Ill.	1.10	1.20	1.35	1.35	1.20	1.20
Eastern Pennsylvania	1.35	1.35	1.45	1.35	1.35	1.35
Munns, N. Y.	1.00	1.50	1.50	1.40	1.25	
Northern New Jersey			1.60			
Prospect, N. Y.	1.00	1.40	1.40	1.30	1.30	
Walford, Penn.		1.30b	1.30b	1.40b	1.40b	1.60c
Watertown, N. Y.	1.00		1.75	1.50	1.50	1.50
Western New York	.85	1.25	1.25	1.25	1.25	1.25
CENTRAL						
Alton, Ill.	1.75		1.75	1.50		
Bloomville, Middlepoint, Dunkirk, Bellevue, Waterville, No. Baltimore, Holland, Kenton, New Paris, Ohio; Monroe, Mich.; Huntington, Bluffton, Ind.	1.00	1.10	1.10	1.10	1.00	1.00
Buffalo, Iowa	.90		1.25	1.05	1.10	1.10
Chicago, Ill.	.80	1.00	1.00	1.00	1.00	1.00
Cypress, Ill.	1.25	1.30	1.25	1.25	1.25	1.15
Dundas, Ont.	.75	.90	.90	.80	.80	.80
Greencastle, Ind.	1.25	1.25	1.05	1.05	1.05	1.05
Krause, Ill.	1.10	1.20	1.35	1.35	1.20	1.20
Lannon, Wis.	.85	1.10	1.10	.95	.95	.95
Linwood, Iowa	.90		1.20	1.00	1.10	1.10
Northern Wisconsin	.75		1.05	.95	.95	
St. Vincent de Paul, P. Q.	.75	1.25@1.45	1.10	1.00	1.00	1.00
Stone City, Iowa	.75			1.10@1.20	1.05	
Toronto, Canada	2.00‡	2.00‡	2.00‡	1.80‡	1.80‡	1.80‡
Valmeyer, Ill.	1.10	1.20	1.35	1.35	1.20	1.20
Waukesha, Wis.	1.15	1.15	1.15	1.15	1.15	1.15
Youngstown, Ohio				1.50	1.60	1.60
SOUTHERN:						
Alderson, W. Va.	.75	1.75	1.75	1.60	1.50	
Bridgeport and Chico, Texas	1.00§	1.35a	1.30a	1.25	1.25	1.10
Cartersville, Ga.	1.50	1.50	1.50	1.00	1.00	1.00
El Paso, Texas	1.00	1.00	1.00	1.00		
Ft. Springs, W. Va.	.60	1.60	1.60	1.50	1.40	
Graystone, Ala.	Crusher run fluxing stone, 1.00 per net ton					
Graysville, Ga.	1.00@1.25	1.00@1.25		.85@1.25	.85@1.25	
WESTERN:						
Atchison, Kans.	.50	2.00	2.00	2.00	2.00	1.60‖@1.80
Blue Spr'gs & Wymore, Neb.	.20	1.45	1.45	1.35@1.40	1.25@1.30	1.20
Cape Girardeau, Mo.	1.35		1.25	1.25	1.00	
Kansas City, Mo.	1.00	1.65	1.65	1.65	1.65	1.65

Crushed Trap Rock

City or shipping point	Screenings, ¼ inch down	½ inch and less	¾ inch and less	1½ inch and less	2½ inch and less	3 inch and larger
Branford, Conn.	.60	1.60	1.35	1.15	1.00	
Cypress, Ill.	1.00@1.10					
Duluth, Minn.	1.00	2.25	1.90	1.50	1.35	1.35
Dwight, Calif.	1.75	1.75	1.75	1.75	1.75	
Eastern Maryland	1.10	1.75	1.70	1.60	1.50	1.50
Eastern Massachusetts	.85	1.75	1.75	1.25	1.25	1.25
Eastern New York	.75	1.25	1.25	1.25	1.25	1.25
Eastern Pennsylvania	1.10	1.75	1.70	1.60	1.50	1.50
Meriden, Middlefield, New Britain, Rocky Hill, Conn.	.60	1.60	1.35	1.15	1.00	1.00
Minneapolis, Minn.	1.25		2.25	2.00	1.75	
Northern New Jersey	1.50	2.00	1.80	1.40	1.40	
Richmond, Calif.	.50*		1.50*	1.50*	1.50*	
San Diego, Calif.	.50@ .75	1.80@1.90	1.60@1.80	1.35@1.55	1.35@1.55	1.25@1.45
Westfield, Mass.	.60	1.50	1.35	1.20	1.10	

Miscellaneous Crushed Stone

City or shipping point	Screenings, ¼ inch down	½ inch and less	¾ inch and less	1½ inch and less	2½ inch and less	3 inch and larger
Berlin, Utley and Red Granite, Wis.	1.60	1.70	1.60	1.50	1.40	
Eastern Penn.—Sandstone	1.25	1.65	1.60	1.40	1.40	1.25
Eastern Penn.—Quartzite	1.20	1.35	1.20	1.20	1.20	1.20
Lithonia, Ga.—Granite Sand	.50	1.75	1.75	1.25	1.15	
Lohrville, Wis.	1.65	1.65@1.70	1.65	1.45	1.50	
Middlebrook, Mo.—Granite	3.00@3.50		2.00@2.25	2.00@2.25		1.25@2.20
Northern New Jersey (Basalt)	150	2.00	1.80	1.40	1.40	

* Cubic yd. †1 in. and less. ‡Prices include 90c freight. ‖Rip rap per ton. §Dust in. (a) Dust out; (b) less 5c 10 days; (c) less 10c 10 days (2¾" to ⅝").

Agricultural Limestone
(Pulverized)

Asheville, N. C.—Analysis, 57% $CaCO_3$, 39% $MgCO_3$; 50% thru 100 mesh; 200-lb. burlap bag, 4.00; bulk	2.75
Branchton, Penn.—100% thru 20 mesh; 60% thru 100 mesh; 45% thru 200 mesh. (Less 50 cents commission to dealers)	5.00
Bridgeport and Chico, Texas; bulk	5.50
Cartersville, Ga.—Analysis 68% $CaCO_3$, 30% $MgCO_3$; pulverized	2.00
50% thru 50 mesh	1.50
Chaumont, N. Y.—Pulverized limestone, bags, 4.00; bulk	**2.50**
Colton, Calif.—Analysis, 95% $CaCO_3$, 3% $MgCO_3$—all thru 20 mesh—bulk	4.00
Dundas, Ont., Can.—Analysis, 53.80% $CaCO_3$, 43.31% $MgCO_3$; 35% thru 100 mesh, 50% thru 50 mesh, 100% thru 10 mesh; bags, 4.75; bulk	3.00
Hillsville, Penn.—Analysis, 94% $CaCO_3$, 1.40% $MgCO_3$, 75% thru 100 mesh; sacks, \$5.00; bulk	3.50
Jamesville, N. Y.—Analysis, 89.25% $CaCO_3$; 5.25% $MgCO_3$; pulverized, bags, 4.00; bulk	2.50
Knoxville, Tenn.—80% thru 100 mesh, bags, 3.95; bulk	2.70
Linville Falls, N. C.—Analysis, 57% $CaCO_3$, 39% $MgCO_3$; 50% thru 100 mesh; 200-lb. burlap bag, 4.00; bulk	2.75
Marblehead, Ohio—Analysis, 83.54% $CaCO_3$, 14.92% $MgCO_3$; 60% thru 100 mesh; 70% thru 50 mesh; 100% thru 10 mesh; 80 lb. paper sacks, 5.00; bulk	3.50
Marion, Va.—Analysis, 90% $CaCO_3$, 2% $MgCO_3$; 42.5% thru 100 mesh, 11.3% thru 80, 20.2% thru 60, 22.8% thru 40, 3.2% thru 20 and under or 75% thru 40 mesh; pulverized, per ton	2.00
Mayville Wis.—59.8% thru 60 mesh	2.35
Mountville, Va.—Analysis 76.60% $CaCO_3$, 22.83% $MgCO_3$; 50% thru 100 mesh, 100% thru 20 mesh—125-lb. hemp bags	5.00
Osborne, Penn.—100% thru 20 mesh; 60% thru 100 mesh; 45% thru 200 mesh. (Less 50 cents commission to dealers)	5.00
Piqua, Ohio—Total neutralizing power 95.3%; 100% thru 10, 60% thru 50; 50% thru 100	2.10@2.25
100% thru 10, 90% thru 50, 80% thru 100; bags, 5.00; bulk	3.50
100% thru 100, 85% thru 200; bags, 7.00; bulk	5.50
Rockdale, Mass.—Analysis, 90% $CaCO_3$—50% thru 100 mesh; paper bags, 4.75; cloth, 5.25; bulk	3.25
Watertown, N. Y.—Analysis, 96-98% $CaCO_3$, pulverized limestone, bags, 4.00; bulk	2.00
West Stockbridge, Mass.—Analysis, 90% $CaCO_3$—50% thru 100 mesh; paper bags, 4.75; cloth, 5.25; bulk	3.25

Agricultural Limestone
(Crushed)

Alderson, W. Va.—Analysis, 90% $CaCO_3$; 50% thru 100 mesh	1.50
Alton, Ill.—Analysis 98% $CACO_3$; 50% thru 4 mesh, 3.00; 90% thru 4 mesh	1.75
Bedford, Ind.—Analysis, 98½% $CACO_3$, ½% $MgCO_3$; 90% thru 10 mesh	1.50
Bettendorf, Iowa—97% $CaCO_3$, 2% $MgCO_3$; 50% thru 100 mesh; 50% thru 4 mesh	1.50
Blackwater, Mo.—95% $CaCO_3$; 100% thru 8 mesh	1.00
Bridgeport and Chico, Texas—90% thru 100 mesh; 50% thru 100 mesh; 90% thru 50 mesh, bulk	2.50
50% thru 50 mesh; 90% thru 4 mesh; 50% thru 4 mesh; bulk	1.50
Cape Girardeau, Mo.—Analysis, 93% $CaCO_3$, 3.5% $MgCO_3$; 90% thru 50 mesh	1.50

(Continued on next page)

Agricultural Limestone

(Continued from preceding page)

Carthage, Mo.—Analysis, 98½% $CaCO_3$; 100% thru 10 mesh, 30% thru 100 mesh	1.75
Chicago, Ill.—50% thru 100 mesh; 90% thru 4 mesh	.80
Cypress, Ill.—Analysis, 90 to 96% $CaCO_3$; 50% thru 100 mesh, 90% thru 50 mesh, 50% thru 50 mesh	1.90
Ft. Springs, W. Va.—Analysis, 90% $CaCO_3$; 90% thru 50 mesh	1.50
Kansas City, Mo.—50% thru 100 mesh	1.25
Krause, Columbia and Valmeyer, Ill.—Analysis, 90% $CaCO_3$; 90% thru 4 mesh	1.10
Lannon, Wis.—Analysis, 54% $CaCO_3$, 44% $MgCO_3$; 99% through 10 mesh; 46% through 60 mesh	2.00
Screenings (¼ in. to dust)	1.00
Marblehead, Ohio.—Analysis, 83.54% $CaCO_3$, 14.92% $MgCO_3$; 100% thru 4 mesh; 85% thru 10 mesh; 53% thru 50 mesh; 40% thru 100 mesh bulk	2.60
32% thru 100 mesh; 51% thru 50 mesh; 83% thru 10 mesh; 100% thru 4 mesh (meal) bulk	2.25
Middlepoint, Bellevue, Kenton, Ohio; Monroe, Mich.; Huntington and Bluffton, Ind.—Analysis, 52% $CaCO_3$, 44% $MgCO_3$; meal, 100% thru 4 mesh, 35% thru 100 mesh	.75@ 1.50
Milltown, Ind.—Analysis, 94.41% $CACO_3$, 2.95% $MgCO_3$; 30.8% thru 100 mesh .38% thru 50 mesh	1.45@ 1.60
Moline, Ill.—97% $CaCO_3$, 2% $MgCO_3$—50% thru 100 mesh; 50% thru 4 mesh	1.50
Pixley, Mo.—Analysis, 96% $CACO_3$; 50% thru 50 mesh	1.25
River Rouge, Mich.—Analysis, 54% $CaCO_3$, 40% $MgCO_3$; bulk	.80@ 1.40
Stone City, Iowa.—Analysis, 98% $CaCO_3$; 50% thru 50 mesh	.75

Pulverized Limestone for Coal Operators

Hillsville, Penn., sacks, 4.50; bulk	3.00

Miscellaneous Sands

Silica sand is quoted washed, dried and screened unless otherwise stated.

Glass Sand:

Berkeley Springs, W. Va	2.25@ 2.50
Cedarville, N. J.—Damp	1.75
Dry	2.25
Cheshire, Mass:	
6.00 to 7.00 per ton; bbl	2.50
Columbus, Ohio	1.25@ 1.50
Grays Summit and Klondike, Mo	2.00
Los Angeles, Calif.—20-70 mesh	5.00
Mapleton Depot, Penn	2.25
Massillon, Ohio	3.00
Michigan City, Ind.	.50
Mineral Ridge and Ohlton, Ohio	2.50
Pacific, Mo.	2.25@ 3.00
Pittsburgh, Pa.—Dry	4.00
Damp	3.00
Ridgway, Pa.	2.50
Rockwood, Mich.	2.75@ 3.25
Round Top, Md.	2.25
San Francisco, Calif.	3.00@ 3.50
St. Louis, Mo	1.50@ 3.00
South Vineland, N. J.—Damp	1.75
Dry	2.25
Thayers, Penn.	1.00@ 2.50
Utica, Ill.	1.25
Zanesville, Ohio	2.50

Foundry Sand:

Albany, N. Y.:	
Core	1.50
Molding fine, brass molding	2.25
Molding coarse	2.00
Sand blast	4.00
Arenzville, Ill.:	
Core	.75
Molding fine	1.40@ 1.60
Brass molding	1.75
Cheshire, Mass.—Furnace lining, molding fine and coarse	5.00
Sand blast	5.00@ 8.00
Stone sawing	6.00

(Continued on next page)

Wholesale Prices of Sand and Gravel

Prices given are per ton, f. o. b. producing plant or nearest shipping point

Washed Sand and Gravel

City or shipping point	Fine Sand, 1/10 in. down	Sand, ¼ in. and less	Gravel, ½ in. and less	Gravel, 1 in. and less	Gravel, 1½ in. and less	Gravel, 2 in. and less
EASTERN:						
Attica, N. Y.	.75	.75	.85	.75	.75	.75
Buffalo, N. Y.	1.10	.95			.85	
Erie, Penn.		1.00		1.25	1.50	
Farmingdale, N. J.	.58	.48	.85	1.10	1.10	
Franklinville, N. Y.	.75	.75	.85	.75	.75	.75
Leeds Jct., Maine		.50	1.75		1.35	1.25
Machias, N. Y.	.75	.75	.75	.75	.75	.75
Northern New Jersey		.40@ .60	1.25	1.25	1.25	1.25
Pittsburgh, Penn., and vicinity	1.25	1.25	1.00	1.00	.85	.85
Shining Point, Penn.			1.00	1.00	1.00	1.00
Washington, D. C.—Rewashed, river	.85	.85	1.70	1.50	1.30	1.30
CENTRAL:						
Attica, Ind.	.75	.75	.75	.75	.75	.75
Barton, Wis.		.22@ .40	.20@ .40	.20@ .40	.32@ .40	
Columbus, Ohio.	.75	.75@1.00	.75@1.00	.75@1.00	.75@1.00	.75@1.00
Covington, Ind.	.75	.75	.75	.75	.75	.75
Des Moines, Iowa	.50	.50	1.25	1.60	1.60	1.60
	Unwashed ballast, .50 a ton; washed, .75 (none screened)					
Eau Claire, Wis.	.75@1.00	.40	.85@1.25			.85
Elkhart Lake, Wis.	.50	.40	.50	.50	.50	.50
Ft. Dodge, Iowa	1.00		2.05	2.05	2.05	
Ft. Worth, Texas	2.00	2.00	2.00	2.00	2.00	2.00
Grand Rapids, Mich		.50		.80	.70	.70
Hamilton Ohio		1.00			1.00	
Hersey, Mich.		.50				.70
Indianapolis, Ind.	.60	.60		.90	.75@1.00	.75@1.00
Janesville, Wis.		.65@ .75			.65@ .75	
Mason City, Iowa	.45@ .55	.45@ .55	1.35@1.45	1.45@1.55	1.40@1.50	1.35@1.45
Mankato, Minn.		.50	1.25	1.25	1.35	
Milwaukee, Wis.	1.01	1.01	1.21	1.21	1.21	1.21
Minneapolis, Minn.*	.65	2.50†	2.00§		2.00	1.75
Moline, Ill.	.60	.60	1.20	1.20	1.20	1.20
Palestine, Ill.	.75	.75	.75	.75	.75	.75
Riton, Wis.	.40	.20			.40	
St. Louis, Mo., f. o. b. cars	1.18	1.45	1.65§	1.45		1.45‖
Silverwood, Ind.	.75	.75	.75	.75	.75	.75
Summit Grove, Ind.	.75	.75	.75	.75	.75	.75
Terre Haute, Ind.	.75	.60	.75	.90	.90	.85
Waukesha, Wis.	.55	.55	.75	.75	.75	.75
Winona, Minn.	.40	.40	1.25	1.25	1.10	1.00
Yorkville, Sheridan, Oregon, Moronts, Ill.			Average .60@.65 pit			
Zanesville, Ohio	.70	.60	.60		.90	
SOUTHERN:						
Brookhaven, Miss., Roseland La.		.50	1.35			
Charleston, W. Va	all sand 1.37 f.o.b. cars		all gravel 1.47 f.o.b. cars			
Chehaw, Ala.	1.24	1.24		1.90	1.90	1.90
Estill Springs and Sewanee, Tenn.	1.00@1.25	.90			.85	.85
Knoxville, Tenn.	1.00	1.00	1.20	1.20	1.20	1.20
Macon and Gallaird, Ga.	.50	.50	.75	.65	.65	.65
New Martinsville, W. Va.	1.00	.90		1.30		.90
WESTERN:						
Baldwin Park, Calif.		.25@ .35			.50@ .75	
Crushed rock	.90@1.10	.60@ .90	.60@ .90	.60@ .90	.60@ .90	
Kansas City, Mo.		Kaw river sand .75 per ton f.o.b. plants				
Los Angeles, Calif.	1.00*	1.00*	1.50*	1.50*	1.40*	1.40*
Pueblo, Colo.	1.10*	.90*		1.60*		1.50*
San Diego, Calif.	50@ .65	.80@ .90	1.40@1.50	1.20@1.30	1.00@1.10	1.00@1.10
Seattle, Wash. (bunkers)	1.50*	1.50*	1.50*	1.50*	1.50*	1.50*
Webb City, Mo.	.75	.75	.25@ .75b	.85b	1.25c	1.15c

Bank Run Sand and Gravel

City or shipping point	Fine Sand, 1/10 in. down	Sand, ¼ in. and less	Gravel ½ in. and less	Gravel, 1 in. and less	Gravel, 1½ in. and less	Gravel, 2 in. and less
Boonville, N. Y.	.60@ .80		.55@ .75			1.00
Brookhaven, Miss., Rosel'd, La.	.75	.50			1.25	
Chehaw, Ala.	.90@1.00					
Dudley, Ky.‡	1.05	1.05		.95		
East Hartford, Conn.			Sand, .65 per cu. yd.			
Elkhart Lake, Wis.	.50					
Gainesville, Texas		.95				.55
Grand Rapids, Mich.				.55		
Hamilton, Ohio					.70	
Hersey, Mich.				.55		
Indianapolis, Ind.		Mixed gravel for concrete work, .65				
Lindsay, Texas						.55
Macon, Ga.	.35	.35				
Mankato, Minn.			Pit run gravel, .60			
Moline, Ill.	.60	.60	Concrete gravel, 50% G., 50% S., 1.00			
Montezuma, Ind.						.60
St. Louis, Mo.		Mine run gravel 1.55 per ton				
Shining Point, Penn.		Concrete sand, 1.10 ton				
Summit Grove, Ind.	.50	.50	.50	.50	.50	.50
Waukesha, Wis.	.60	.60	.60	.60	.60	.60
Winona, Minn.	.60					
York, Penn.	1.10					
Zanesville, Ohio		.60				

*Cubic yd.; †roofing gravel; §⅝ in. and less; ‡crushed rock; ‖2½ in. and less; (a) ¾ in. and less; (b) flint chats; (c) crushed flint.

Miscellaneous Sands

(Continued from preceding page)

Columbus, Ohio:
- Core .25@ .30
- Furnace lining 2.50
- Molding fine 2.00
- Molding coarse 1.50@ 2.00
- Sand blast 3.00@ 4.00
- Stone sawing 1.50
- Traction .30@ .65
- Brass molding 2.00@ 2.50

Dresden, Ohio:
- Core 1.25
- Furnace lining, brass molding 1.50
- Molding fine and coarse 1.25@ 1.50
- Traction 1.00

Dunbar, Penn.:
- Traction (damp) 2.00

Eau Claire, Wis.:
- Sand blast 3.00@ 4.25

Elco, Ill.:
- Ground silica per ton in carloads 20.00@31.00

Estill Springs and Sewanee, Tenn:
- Molding sand 1.40

Franklin, Penn.:
- Core 1.50@ 1.75
- Furnace lining, molding fine 1.75
- Molding coarse 1.50
- Brass molding 2.00

Grays Summit, Mo.:
- Molding fine 1.75@ 2.00

Joliet, Ill.:
- No. 2 molding sand; also loam for luting purposes and open-hearth work .65@ .85

Klondike, Mo.:
- Molding fine 1.75@ 2.00

Los Angeles, Calif.:
- Roofing sand—stucco material, 8-12 and 12-20 mesh 6.00

Mapleton Depot, Penn.:
- Molding fine 2.25
- Traction 2.00

Massillon, Ohio:
- Molding fine, coarse, furnace lining and core, traction 2.50

Michigan City, Ind.:
- Core .50@ .55
- Traction .40

Mineral Ridge and Ohlton, Ohio:
- Core 2.25
- Furnace lining, molding fine and coarse, roofing sand, sand blast, stone sawing, traction (all green) 2.00

Montoursville, Penn.:
- Core, molding fine 1.40
- Traction 1.35

New Lexington, Ohio:
- Molding fine 2.00
- Molding coarse 1.50

Ottawa, Ill.:
- Crude silica sand .75@ .85
- Core 1.50
- Sand blast 2.50

Pacific, Mo.:
- Core, furnace lining 1.00@ 1.25
- Molding fine .90@ 1.00
- Stone sawing 1.00@ 1.75
- Molding coarse .85@ 1.00

Ridgway, Penn.:
- Core 2.00
- Furnace lining, molding fine, molding coarse 1.25
- Traction 2.25

Round Top, Md.:
- Core 1.60
- Building sand 1.00
- Traction 1.75

St. Louis, Mo.:
- Core 1.00@ 1.75
- Furnace lining 1.50
- Molding fine 1.50@ 2.50
- Molding coarse 1.25@ 1.75

Crushed Slag

City or shipping point	Roofing	¼ in. down	½ in. and less	¾ in. and less	1½ in. and less	2½ in. and less	3 in. and larger
EASTERN:							
Buffalo, N. Y.	2.25	1.25	1.25	1.25	1.25	1.25	1.25
E. Canaan, Conn.	3.00	1.00	2.25	1.25	1.25	1.15	1.15
Eastern Penn. and Northern N. J.	2.50	1.20	1.50	1.20	1.20	1.20	1.20
Reading, Pa.	2.50	1.00		1.25			
Western Penn.	2.50	1.25	1.50	1.25	1.25	1.25	1.25
CENTRAL:							
Ironton, Ohio	2.05	1.45	1.75	1.45		1.45	
Jackson, Ohio		1.30		1.30	1.30	1.30	
Toledo, Ohio	1.50	1.25	1.25	1.25	1.25	1.25	1.25
Youngstown, Dover, Hubbard, Leetonia, Struthers, O.	2.00	1.25	1.35	1.35	1.25	1.25	1.25
SOUTHERN:							
Ashland, Ky.		1.55		1.55	1.55	1.55	
Ensley and Alabama City, Ala.	2.05	.80	1.25	1.15	.90	.90	.80
Longdale, Goshen, Glen Wilton, Roanoke, Ruesens, Va.	2.50	1.00	1.25	1.25	1.25	1.15	1.15

Lime Products (Carload Prices Per Ton F.O.B. Shipping Point)

	Finishing hydrate	Masons' hydrate	Agricultural hydrate	Chemical hydrate	Ground burnt lime Blk.	Ground burnt lime Bags	Lump lime Blk.	Lump lime Bbl.
EASTERN:								
Berkeley, R. I.			12.00					2.30
Buffalo, N. Y.				12.00				
Lime Ridge, Penn.							5.00a	
West Stockbridge, Mass.		10.50	6.00l					3.25m
Williamsport, Penn.			10.00				6.00	
York, Penn.		10.50	10.50	11.50			8.50	1.65i
CENTRAL:								
Cold Springs, Ohio		9.50	9.00				9.00	
Delaware, Ohio	12.50	9.00	9.00	10.00			9.00	1.60
Gibsonburg, Ohio	12.50				9.00	11.00		
Huntington, Ind.		9.50	9.50		9.00		8.50	1.50b
Luckey, Ohio (f)	12.50							
Marblehead, Ohio		9.50	9.50				8.50	1.50c
Marion, Ohio		9.50	9.50				8.50	1.70j
Mitchell, Ind.		12.00	12.00	12.00	11.00		10.00	1.70e
Tiffin, Ohio					9.00			
White Rock, Ohio	12.50				9.00	11.00		
Woodville, Ohio	12.50†	9.50†	8.50†		9.00		9.00	1.60
SOUTHERN:								
Erin, Tenn.							8.50	1.40*
El Paso, Texas							9.00	1.50
Graystone, Ala.	12.50	11.00	11.00	11.00			8.50n	1.50k
Karo, Va.		10.50	9.00				7.00g	1.65h
Knoxville, Tenn.	12.50	11.00		11.00		1.35	8.50	1.50
Staunton, Va. (boss lime)								1.30
Varnons, Fla. (f)		10.50	6.00	11.00			8.50	1.50
Zuber and Ocala, Fla.	14.00	12.00	10.00				11.00	1.60
WESTERN:								
Kirtland, N. M.							12.50h	
San Francisco, Calif.	22.00	22.00	15.00	22.00				2.50
Tehachapi, Calif.							13.00	2.00d

*And 1.50; †50-lb. paper bags; (a) F. O. B. Kilns; (b) wooden bbl.; (c) wooden, steel 1.70; (d) to 2.15; (e) wood bbl.; $2.20 drum in steel; (f) dealers' prices; (g) to 9.50; (h) to 1.75; (i) 200 lb. bbl.; 2.65, 300 lb. bbl.; (j) steel; (k) jute bags, 1.35; (l) bags; (m) finishing lime, $2.50 common; (n) to 10.00.

Miscellaneous Sands

(Continued)

- Roofing sand 1.75
- Sand blast 3.50@ 4.50
- Stone sawing 1.25@ 2.25
- Traction 1.25
- Brass molding 2.00@ 3.00

San Francisco, Calif.:
- (Washed and dried)—Core, molding fine, roofing sand and brass molding 3.00@ 3.50

San Francisco, Calif. (Direct from Pit)
- Furnace lining, molding coarse, sand blast 3.60
- Stone sawing, traction 2.30

Tamalco, Ill.:
- Molding coarse 1.40@ 1.60
- Brass molding 1.75

Tamms, Ill.:
- Ground silica per ton in carloads 20.00@31.00

Thayers, Penn.:
- Core 2.00
- Molding fine and coarse 1.25
- Traction 2.25

Utica, Ill.:
- Core, furnace lining, molding fine and coarse .60@ 1.25
- Roofing sand, traction 1.00
- Sand blast 2.50
- Stone sawing 1.00@ 2.50
- Brass molding 1.25

Utica, Penn.:
- Core, molding fine, brass molding 2.00
- Molding coarse 1.50@ 1.75

Warwick, Ohio.:
- Core, molding fine and coarse (all green) 1.75; all dry 2.50
- Traction 2.50
- Furnace lining (green) 1.75

Zanesville, Ohio:
- Sand blast, core, traction 2.50
- Furnace lining 2.25
- Molding fine and coarse; brass molding 1.50@ 1.75

Talc

Prices given are per ton f.o.b. (in carload lots only), producing plant, or nearest shipping point.

Baltimore, Md.:
- Crude talc (mine run) 3.00@ 4.00
- Ground talc (20-50 mesh), bags 10.00
- Cubes 55.00
- Blanks (per lb.) .08
- Pencils and steel workers' crayons, per gross 1.25

Chatsworth, Ga.:
- Crude (for grinding) 6.00
- Ground (150-200 mesh, bags) 12.00
- Pencils and steel workers' crayons 1.25@ 2.50

Chester, Vt.:
- Ground (20-70 mesh) 7.00@ 8.00

E. Granville, Rochester, Johnson, Waterbury, Vt.:
- Ground talc (20-50 mesh) bags 7.00@10.00
- Ground talc (150-200 mesh) bags 10.00@25.00
- Pencils and steel workers' crayons, per gross .75@ 2.00

Emeryville, N. Y.:
- (Double air floated) including bags; 325 mesh 14.75

Hailesboro, N. Y.:
- Ground (150-200 mesh) bags 18.00

Henry, Va.:
- Crude talc (mine run) per 2000-lb. ton 2.75@ 3.50
- Ground (150-200 mesh), bags 8.50@14.00

Joliet, Ill.
- Ground (150-200 mesh) bags 28.00@30.00

Keeler, Calif.:
- (150-200 mesh); carloads, 30 tons or more (bags extra) 20.00@30.00

Marshall, N. C.:
- Crude 4.00@ 8.00
- Ground (20-50 mesh), bags extra 6.50@ 8.50
- Ground (150-200 mesh), bags 8.00@12.00

Natural Bridge, N. Y.:
- Ground talc (300-325 mesh), 200-lb. bags 13.00@15.00

Rock Phosphate

Prices given are per ton (2240-lb.) f.o.b. producing plant or nearest shipping point.

Lump Rock

- **Centerville, Tenn.—B.P.L. 65%, bags 8.50**
  - **Bulk 6.50**
- Gordonsburg, Tenn.—B.P.L. 68-72% 4.00@ 4.50
- Mt. Pleasant, Tenn.—B.P.L. 72% 5.50@ 6.00
  - 13% phosphoric acid, 95% thru 80 mesh 5.75
  - 75% hand mined 6.50@ 6.75
  - 75% washed over ¼-in. screen 6.75
  - 75% max. 5½% I and A 6.50@ 7.00
  - 78% max. 4½% I and A 8.00
- **Tennessee—F. O. B. mines, gross ton, unground Tenn. brown rock, 72% min. B.P.L. 5.50**
- Twomey, Tenn.—B.P.L. 65% 7.00@ 8.00

(Continued on next page)

Roofing Slate

The following prices are per square (100 sq. ft.) for Pennsylvania Blue-Clay Roofing Slate, f. o. b. cars quarries:

Sizes	Genuine Bangor, Washington Big Bed, Franklin Big Bed	Genuine Albion	Slatington Small Bed	Genuine Bangor Ribbon
24x12	$10.20	$10.00	$8.10	$7.80
24x14	10.20	10.00	8.10	7.80
22x12	10.80	10.00	8.40	8.75
22x11	10.80	10.50	8.40	8.75
20x12	12.60	10.50	8.70	8.75
20x10	12.60	11.00	8.70	8.75
18x10	12.60	11.00	8.70	8.75
18x 9	12.60	11.00	8.70	8.75
16x10	12.60	11.00	8.40	8.75
16x 9	12.60	11.00	8.40	8.75
16x 8	12.60	11.00	8.40	8.75
18x12	12.60	11.00	8.70	8.75
16x12	12.60	11.00	8.40	8.75
14x10	11.10	11.00	8.10	7.80
14x 8	11.10	10.50	8.10	7.80
14x 7 to 12x6	9.30	10.50	7.50	7.80
	Mediums	Mediums	Mediums	Mediums
24x12	$ 8.10	$8.10	$7.20	$5.75
22x11	8.40	8.40	7.50	5.75
Other sizes	8.70	8.70	7.80	5.75

For less than carload lots of 20 squares or under, 10% additional charge will be made.

(Continued from preceding page)

Ground Rock

Mt. Pleasant, Tenn.—B.P.L. 72%	5.50@ 6.00
Twomey, Tenn.—B.P.L. 65%	7.00@ 8.00

Florida Soft Phosphate

(Raw Land Pebble)

Per Ton

Florida—F. O. B. mines, gross ton, 68/66% B.P.L., Basis 68%	2.25
70% min. B.P.L., Basis 70%	2.50
72% min. B.P.L., Basis 72%	2.75
75/74% B.P.L., Basis 75%	3.75

Fluorspar

Fluorspar—80% and over calcium fluoride, not over 5% silica; per ton f.o.b. Illinois and Kentucky mines	18.00@19.00
Fluorspar—85% and over calcium fluoride, not over 5% silica; per ton f.o.b. Illinois and Kentucky mines	19.00@20.00

Special Aggregates

Prices are per ton f. o. b. quarry or nearest shipping point.

City or shipping point	Terrazzo	Stucco chips
Barton, Wis., f.o.b. cars		10.50
Chicago, Ill.—Stucco chips, in sacks f.o.b. quarries		17.50
Crown Point, N. Y.—Mica Spar		7.00@ 8.00
Easton, Penn.—Slate granules		7.00@ 7.50
Haddam, Conn.—Felstone buff	12.00	12.00
Harrisonburg, Va.—Blk. marble (crushed, in bags	14.50@22.50	14.50@22.50
Ingomar, Ohio (in bags)		20.00
Middlebrook, Mo.—Red		25.00@30.00
Milwaukee, Wis.		14.00@34.00
Newark, N. J.—Roofing granules		7.50
New York, N. Y.—Red and yellow Verona		32.00
Poultney, Vt., 2000 lb.		6.12
Phillipsburg, N. J.—Evergreen, bulk	8.00@10.00	8.00@10.00
Creme and royal, bulk	15.00@20.00	15.00@20.00
Red Granite, Wis.		7.50
Sioux Falls, S. D.	7.50	7.50
Stockton, Cal.—Crushed quartz, red rock, greenstone, jasper, sacks		*10.00
Tuckahoe, N. Y.—2000 lb.		12.00@20.00
Wauwatosa, Wis.		16.00@34.00
Whitestone, Ga.—White marble chips, net ton in bulk, f.o.b. cars, granite	4.50@ 6.00	4.50@ 6.00

*LCL, 10% higher.

Concrete Brick

Prices given per 1000 brick, f.o.b. plant or nearest shipping point.

	Common	Face
Appleton, Minn.	22.00	
Baltimore, Md.	15.00	24.00
Ensley, Ala. ("Slag-tex")	12.50	22.50@33.50
Eugene, Ore.	25.00	35.00@75.00
Friesland, Wis.	22.00	32.00
Omaha, Neb.	18.00	30.00@40.00
Philadelphia, Penn.	15.75	21.50
Portland, Ore. (del. loc.)	21.00	30.00@100.00
Prairie du Chien, Wis.	14.00	21.50@30.00
Puyallup, Wash.	20.00	30.00@90.00
Rapid City, S. D.	18.00	25.00@45.00
Salem, Ore.	23.00	50.00
Seattle, Wash.	22.00	40.00
Watertown, N. Y.	21.00	35.00
Wauwatosa, Wis.	14.00@18.00	30.00@42.00
Winnipeg, Can.	15.50	

Sand-Lime Brick

Prices given per 1000 brick f. o. b. plant or nearest shipping point, unless otherwise noted.

Barton, Wis.	10.50
Boston, Mass.	15.00@16.50
Dayton, Ohio	12.50@13.50
Grand Rapids, Mich.	11.00
Jackson, Mich.	13.00
Lancaster, N. Y.	12.50
Michigan City, Ind.	11.00
Milwaukee, Wis. (delivered)	13.50
Plant City, Fla.	11.00@15.00
Portage, Wis.	15.00
Rochester, N. Y.	19.75
Saginaw, Mich.	12.00

San Antonio, Texas	12.50@14.00
Syracuse, N. Y. (delivered at job)	20.00
F.o.b. cars	18.00

Gray Klinker Brick

El Paso, Texas	13.00

Lime

Warehouse prices, carload lots at principal cities.

	Hydrated, per ton Finishing	Common
Atlanta, Ga.	22.50	14.00
Baltimore, Md.	24.25	17.85
Cincinnati, Ohio	16.80	14.30
Chicago, Ill.	20.00	18.00
Dallas, Tex.	20.00	——
Denver, Colo.	24.00	——
Detroit, Mich.	22.00	20.00
Minneapolis, Minn. (white)	25.50	21.00
Montreal, Que.		21.00
New York, N. Y.	18.20	13.10
St. Louis, Mo.	24.00	20.00
San Francisco, Calif.	22.60	——
Seattle, Wash. (paper sacks)	24.00	——

Portland Cement

Prices per bbl. and per bag net in carload lots.

	Per Bag	Per Bbl.
Albany, N. Y.		2.62
Atlanta, Ga.		2.35
Boston, Mass.		2.53@3.03†
Buffalo, N. Y.		2.38@2.88†
Cedar Rapids, Iowa	.61	2.44
Cincinnati, Ohio	.61¾	2.47
Cleveland, Ohio	.59¾	2.39
Chicago, Ill.	.55	2.20
Columbus, Ohio		2.44
Dallas, Texas	.53¾	2.15
Davenport, Iowa	.59¾	2.39
Dayton, Ohio		2.48
Denver, Colo.	.63¾	2.55
Detroit, Mich.	.60	2.40
Duluth, Minn.	.54¾	2.19
Indianapolis, Ind.	.60¼	2.41
Kansas City, Mo.	.54¼	2.47
Los Angeles, Cal. (less 5c dis.)	.65	2.83
Memphis, Tenn.		2.60
Milwaukee, Wis.	.58¾	2.35
Minneapolis, Minn.	.60½	2.42
Montreal, Canada (sks. 20c ext.)		1.90b
New Orleans, La.		2.40
New York, N. Y.		2.15@2.65†
Philadelphia, Penn.		2.41@2.81†
Phoenix, Ariz.	.82½	3.30
Pittsburgh, Penn.	.54¾	2.19
Portland, Ore.		3.05
San Francisco, Cal.		2.61*
St. Louis, Mo.	.57½	2.30
St. Paul, Minn.	.60½	2.42
Seattle, Wash. (10c bbl. dis.)		2.90
Toledo, Ohio	.61¼	2.45

NOTE—Add 40c per bbl. for bags.
*5c cash disc. 10 days.
†Prices to contractors, including bags.
(b) Less 10c 20 days.

Mill prices f. o. b. in Carload Lots to Contractors

	Per Bag	Per Bbl.
Buffington, Ind.	.48¾	1.95
Concrete, Wash.		2.60
Dallas, Texas		2.10
El Paso, Tex.	.70	2.08*
Hannibal, Mo.		2.05
Hudson, N. Y.		2.05
Leeds, Ala.		1.95
Los Angeles, Calif.		2.65
Louisville, Ky.		2.35
Northampton, Penn.		1.95
Phoenix, Ariz.		4.30†
Steelton, Minn.	.50	2.00
Universal, Penn.	.58¾	2.35

*Gross, 10c sacks and 10c per bbl. disc 10 days
†Gross, 15c sacks and 5c per bbl. disc. 10 days.

Gypsum Products—CARLOAD PRICES PER TON AND PER M SQUARE FEET, F. O. B. MILL

	Crushed Rock	Ground Gypsum	Agri-cultural Gypsum	Stucco Calcined Gypsum	Cement and Gauging Plaster	Wood Fiber	White Gauging	Sanded Plaster	Keene's Cement	Trowel Finish	Plaster Board ¼x32x36" Weight 1500 lb. Per M Sq. Ft.	Plaster Board ⅜x32x36" Weight 1850 lb. Per M Sq. Ft.	Wallboard, ⅜x32 or 48" Lengths 6'-10', 1850 lb. Per M Sq. Ft.
Agatite, Texas (a)			6.00	10.00	10.00	10.50	10.00		19.00				
Akron, N. Y. (a)	3.00	4.00	6.00	10.00	10.00	10.00	20.20	7.00@9.00	27.35	21.00	19.375	20.00	30.00@32.00
Black Hawk, S. D.	3.50		7.00	10.00	10.00	10.50							
Blue Rapids, Kans. (a)	2.50	4.00	6.00	10.00	10.00	10.50	10.00		23.15	19.00	19.375	20.00	
Denver, Colo.				11.80									
Douglas, Ariz.			6.00		15.00					15.50			
Ft. Dodge, Iowa (a)	2.50	4.00	6.00	10.00	10.00	10.50	15.45		22.70	20.00	19.375	20.00	30.00
Grand Rapids, Mich.	2.50†		6.00‡	10.00	10.00‖	10.00‖							
Gypsum, Ohio (a)	2.75	4.00	6.00	10.00	10.00	10.00	19.25	7.50	26.85	19.00	19.375	20.00	30.00
Port Clinton, Ohio	3.00	4.00	6.00	8.00	10.00	10.00	20.00	7.50	30.15	20.00		20.00	30.00
Portland, Colo.				10.00									
San Francisco, Calif.				15.40*									
Winnipeg, Man.	5.50	5.50	7.00	13.50	15.00	15.00					28.50		35.00

NOTE—Returnable Bags, 10c each; Paper Bags $1.50 per ton extra (not returnable).
*Including sacks at 15c each; (a) prices are net of bags; (†) to 3.00; (‡) to 8.00; (‖) to 12.50.

New Machinery and Equipment

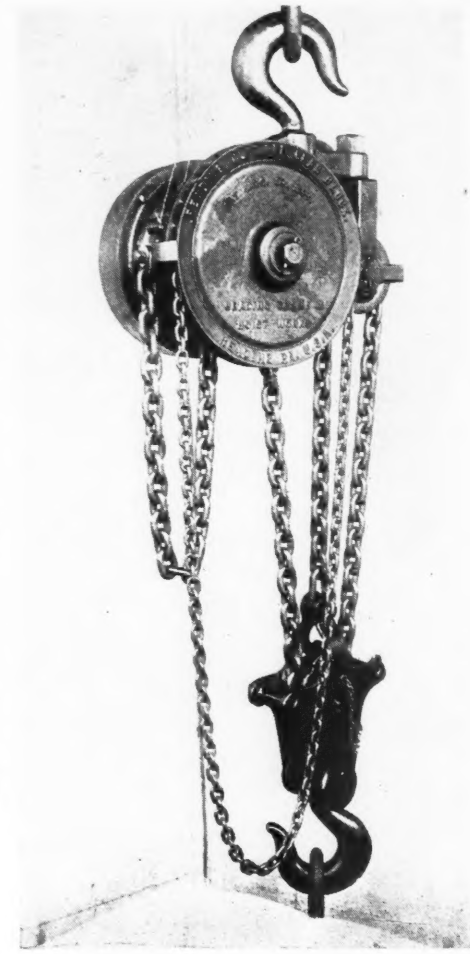
Dust-Proof and Oil-Tight Chain Block

THE Reading Chain and Block Corp., Reading, Penn., has on the market a multiple gear chain block that is claimed to be dust proof and oil tight and particularly adapted to the needs of the rock products industry.

The power for the hoist is obtained through a balanced train of spur gears which operates the chain sheave, located between two central frames. It is said to have an efficiency of 80%, hoists freely and rapidly and holds the load stationary at any one point. The heaviest load may be lowered by a slight pull on the hand chain at an even steady motion.

The brake consists of four parts, is self-adjusting and takes up its own wear. All working parts are enclosed in a dust-proof casing and operate in a bath of oil.

The main bearings and points of suspension are made from high-grade malleable steel; hand and lift chains are tested to 50% overload capacity; hooks are all drop forged and all gears are cut from solid steel blanks. The chain block is made in capacities ranging from ½ to 20 tons.



Multiple gear chain block

L-A Heavy Duty Motors

THE Louis-Allis Co. of Milwaukee, Wis., is putting out a polyphase squirrel-cage type of motor which has some unusual features of design and construction. The makers say that during the 21 years in which they have been building motors they have carried on experiments in their own shops and laboratories, as well as given intensive study to both American and foreign motors, in order to eliminate certain weaknesses in the design of squirrel-cage motors and to bring this type to the high degree of reliability which is contemplated in the original conception of the squirrel-cage design.

They further claim that on account of its design and construction the motor can start abnormally heavy loads, and that the high torque characteristic applies equally to the running torque, and that this has been attained without sacrificing either power factor or efficiency.

The sturdy dependability which the makers claim for this motor is said to be largely due to the development of a single-joint rotor with a one-piece winding. This construction gives extraordinary mechanical ruggedness, and it is claimed that the rotor is electrically indestructible.

One of the cuts shown with this is of the slip-ring or multiple speed type. The motor can also be furnished in a vertical type, with tripod base.

Ingersoll-Rand Air Motor Hoists

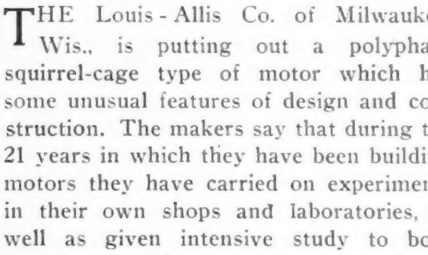
THE Ingersoll-Rand Co., 11 Broadway, N. Y., are now offering a line of new air motor hoists including five different sizes with capacities ranging from 500 lb. to 10,000 lb.

The 500-lb. capacity hoist (size A) was recently put on the market but now the company has developed four larger sizes of similar design so that the same type of hoist is available for heavier work. The four new sizes embody all the features of the smaller hoist except for such variations, as in the gearing on the two heaviest sizes, etc.

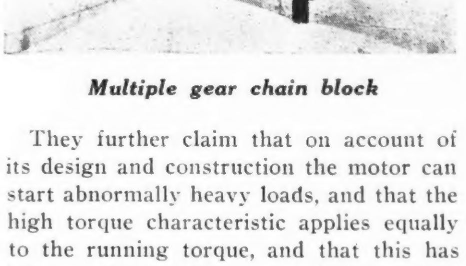
The manufacturers give the following general description of the machine:

"A balanced three-cylinder air motor is used which operates in either direction and without vibration at any speed or load within the rated capacity of the machine. The motor is of the same reliable type such as has long been provided for Ingersoll-Rand hoists. It retains all of the best features which have established their worth by long service, and furthermore embodies new features which add to its economy and durability. Some of the advantages of this motor are its freedom from vibration, the ready manner in which it can be throttled down slowly at all loads and its remarkable absence of lubricating troubles.

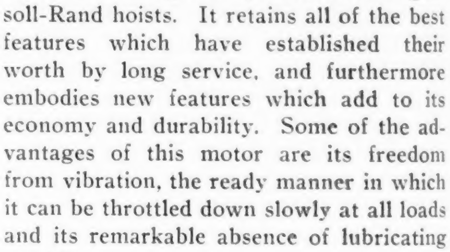
"It should therefore be noted that these hoists are entirely distinct from direct acting cylinder hoists and lifts. The latter consist essentially of only the plunger and a case. The Ingersoll-Rand air hoists, on



Louis-Allis heavy duty, polyphase, squirrel cage type motor



The method of constructing the one-piece wind rotor

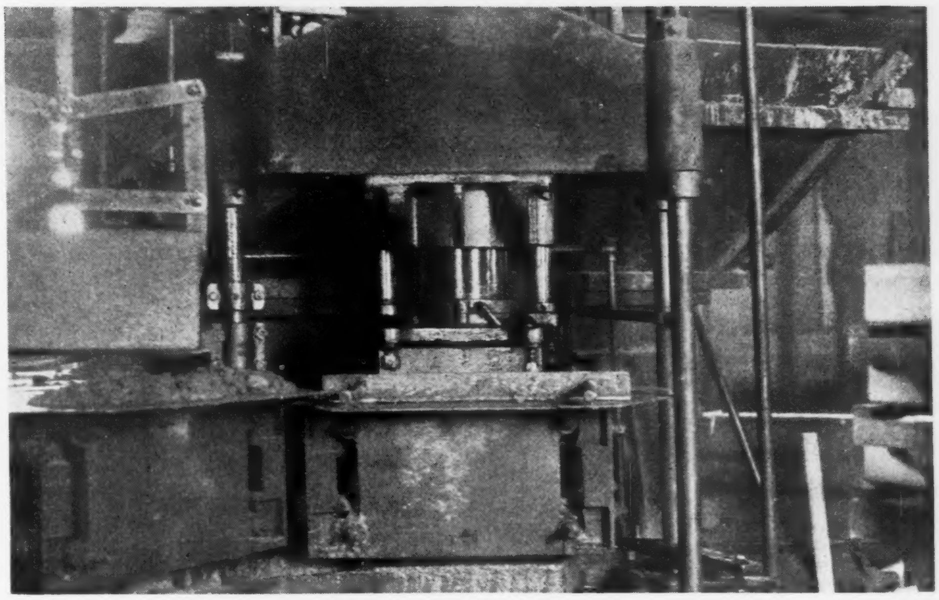


The slip ring or multiple speed type of this motor

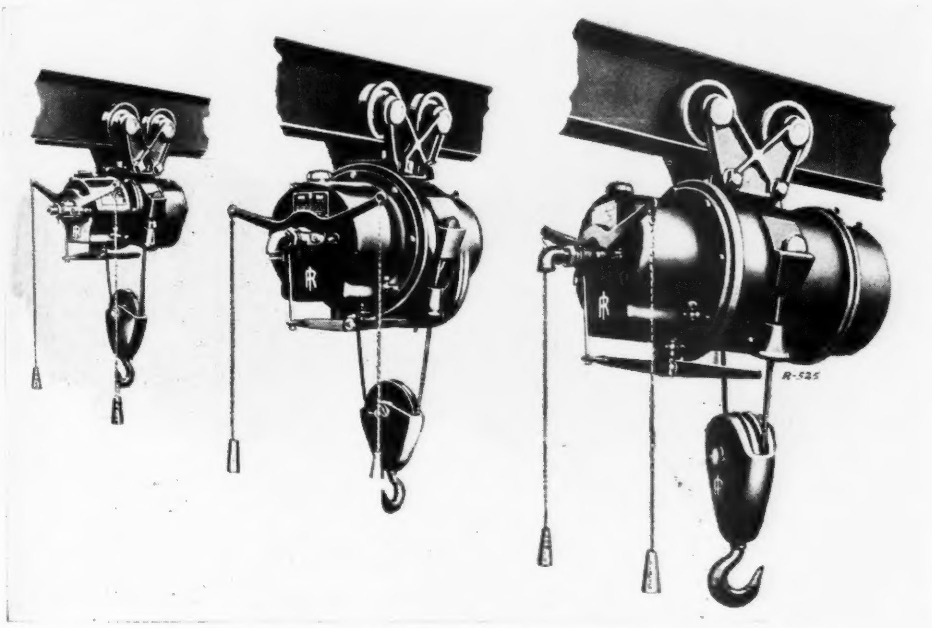
the other hand, are equipped with a high powered and efficient air motor which is geared through a mechanical train to a hoisting drum.

"The throttle graduation on the new hoists is very fine and this insures instant and complete control of the hoist at any speed and contributes to the excellent operating performance. A safety stop lever is provided which closes the throttle and stops the motor whenever the load is by chance raised to the top of the hoist lift.

"The automatic brake is a new and valuable feature, as it holds the load at any desired position for any length of time regardless of air pressure. The brake consists of a disc attached to the motor shaft, and of a brake plunger with a friction face, which is held in contact with the disc by springs whenever the hoist is not operating, i. e., whenever the air supply to the motor is cut off either by throttling or otherwise. It is entirely automatic in its action and requires no attention from the operator."



The block press which has to be very strongly built to withstand the 200,000-lb. pressure under which the blocks are formed



Three of the five sizes of Ingersoll-Rand air motor hoists available in capacities from 500 to 10,000 lb.

Hydraulic Concrete Block Machine

THE hydraulic concrete block machine illustrated here was designed and built by Kenny Bros., who manufacture concrete building blocks at their plant at Goodle street and Gladden avenue, Columbus, Ohio. They built the machine for their own use but its success has been such that they have begun building it for other block manufacturers.

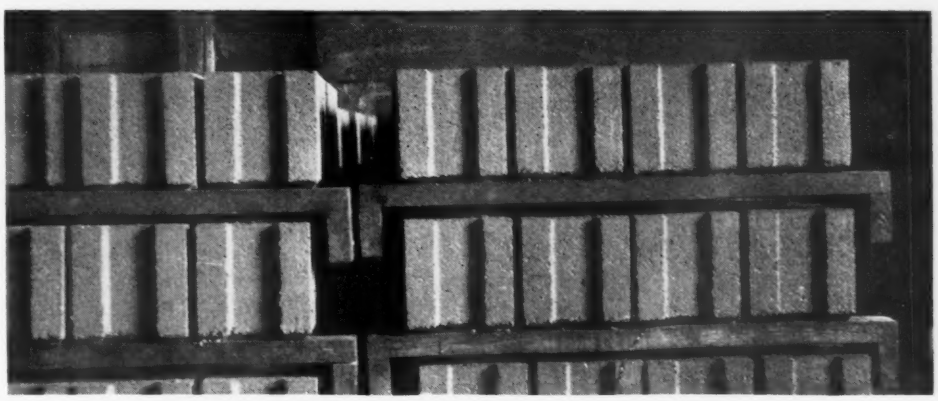
The machine is of the type that forms blocks under heavy pressure. In their factory the concrete in which limestone screenings are used as aggregate is mixed in a small mechanical mixer above the machine and sent down a chute to the mould. The mould is swung through an arc of a circle to a point under the press and a pressure of 200,000 lb. is applied hydraulically. After pressing, the mould is swung to another point where it is pushed out of the mould by hydraulic pressure and on to a wooden pallet. When a pallet is filled it is placed on a car and set aside for hardening and curing.

Being formed under pressure the block is not only hard and dense but homogeneous. All the dimensions are exact and the faces of the block are clean and the edges are sharp.

Novocrete

"NOVOCRETE" is a trade name for a concrete made of portland cement and "mineralized" saw dust, which is saw dust that has received a chemical treatment. It is being introduced in New York and Eastern cities, especially for making light weight concrete building blocks and similar products. The aggregate is patented. It is intended to be a rival of gypsum and porous concrete in making partition blocks.

This is but one of many attempts that are being made to produce a mineral substance that will have the light weight and some other characteristics of lumber for use in small buildings.



The blocks as they come from the machine. Note the even surfaces and sharp edges

News of All the Industry

Incorporations

Ames Sand and Gravel Co., Ames, Iowa, has been incorporated for $25,000.

Union Rock Co., Dover, N. J., has been incorporated for $5,000,000 to deal in stone, gravel, etc.

J. W. Thompson Sun Gravel Plant, Inc., New Orleans, La., has been incorporated for $150,000.

Portland Sand and Gravel Co., 10 Washington street, Morristown, N. J., has been incorporated for $125,000 to deal in sand and gravel.

Lexington Sand and Gravel Co., St. Paul Minn., has been incorporated for $10,000, by E. Y. Arnold, 630 Fuller avenue, and others.

Weston Sand and Gravel Co., Logtown, Miss., has been incorporated for $30,000, by Lamar Otis, C. W. Weston and C. L. Weston.

Roy Mulford, Inc., 23 Broadway, Camden, N. J., has been incorporated for $125,000 to manufacture gypsum, plaster, plaster of paris, etc.

Lime Phosphate Co., Freistatt, Mo., has been incorporated and has leased 1200 acres of phosphate deposits near here and will develop. L. E. Brougher, president; F. W. Voelpel, Aurora, Mo., secretary.

Ohio Lime and Stone Co., Pemberville, Ohio, has been incorporated and the following officers have been elected: President, Dr. C. C. Greiner; vice-president, Frank Zowadue; secretary-treasurer, F. P. Spitzer.

H. J. Harris Quarries, Inc., Richmond, Va., have been incorporated for from $1000 to $50,000 to operate a stone quarry. President, William H. Harris; secretary, W. A. Davis; and M. S. Harris, all of Richmond.

Wiscasset Feldspar Corp., Boston, Mass., has been incorporated for $125,000 to operate feldspar properties and grinding mills for commercial production. President, Wesley I. Newhall; treasurer and representative, Arthur E. Lemont, Newton Center, Miss.

Allied Gravel Co., New Paris, Ind., has been incorporated for 1000 shares common and $20,000 preferred stock, to operate stone quarries, gravel pits, etc. Directors: L. P. Green, C. G. Knoblauch, H. M. Capron, J. V. Sullivan and James S. Adams. Mr. Knoblauch is of New Paris, and the others are all of Chicago.

Sand and Gravel

Umpqua Gravel Co., Marshfield, Ore., had its dredge damaged by fire.

Parkersburg Sand Co., Parkersburg, W. Va., A. P. Turley, president, filed papers of dissolution.

Shaw Brothers, Hamilton, Ohio, are busy moving their gravel plant about 200 ft. south from its present location.

J. L. Shiely Co., 305 Dakota building, St. Paul, Minn., has opened a new gravel pit at Snelling avenue and Wynne street. This plant will have a capacity for 3000 tons of washed gravel a day.

Northwestern Gravel Co., Des Moines, Iowa, is reported to be filling orders from its Cherokee works for washed gravel to be used in the construction of the plant of the Sioux City Service Co.

Babcock & Wilcox, Kasota, Minn., were successful bidders for furnishing 6780 cu. yd. of gravel for surfacing state road No. 24 near Lonsdale, Minn., and were awarded the contract at $1.50 a cu. yd.

Standard Sand and Gravel Co., north of Clinton, Ind., suffered a loss of several tons of hay and about 1000 bushels of wheat when its barn was recently destroyed by fire, thought to have been caused by spontaneous combustion.

Clinton Sand and Gravel Co., Clinton, Ill., installed an additional set of centrifugal pumps at its pit southeast of Clinton, on the Baker land, recently. The company is now working on regular schedule and is able to get out material fast enough to supply the demand, it is stated.

Quarries

Western Stone Co., Ltd., Winnipeg, Man., Canada, has increased its capital from $80,000 tc $150,000.

A. J. Yarborough has filed complaint in Superior court asking that the **Southern Stone Co.**, Greensboro, N. C., a partnership in which he says he owns half interest, be dissolved and that a receiver be appointed by the court to handle the company's affairs.

Thompson Brothers Rock Co., which has been operating a crusher in Kansas City, Mo., for the past four years, has just completed its No. 2 plant, which is located at 54th and Lister, on the Frisco railroad, and has a capacity for 500 tons per day.

A. B. Miller, formerly with the Looney Creek Coal Co., has purchased land near Putney, Ky., for the purpose of opening up a limestone quarry. The operation will be financed by local capitalists and will employ hundreds of men and will open within the next thirty days, it is reported.

Cement

Utica Hydraulic Cement Co., Utica, Ill., has preliminary plans under advisement for the rebuilding of the portion of the machine department at its local mill, destroyed by fire, September 6, with loss estimated at close to $90,000, including equipment.

Canada Cement Co., Ltd., Montreal, Quebec, Canada is distributing honor flags to the plants going a month with no accidents. The No. 8 plant at Port Colborne, Ont., has gone 131 days without accidents and has won its second honor flag this year, it is stated.

Oklahoma Portland Cement Co., Denver, Colo., appeared before the corporation commission recently to plead for a reduced rate on carload shipments of rock shale. The company is asking the commission to apply the same schedule of freight rates to this material as was obtained on carload shipments of cement.

Consolidated Minerals Corp., Tujunga, Calif., has acquired a tract of property in the Little Tujunga Canyon and has preliminary plans under advisement for the construction of a new cement mill and lime manufacturing plant, reported to cost in excess of $350,000, with machinery. The company also purposes to build an addition to its present silica mill, and install additional equipment. Frank J. Buck is production manager in charge.

Gypsum

United States Gypsum Transportation Co. is the new name of the J. B. King Transportation Co.

Upson Co., Lockport, N. Y., manufacturer of composition wallboard products, has commenced the construction of additional buildings at its plant, to be equipped for considerable increase in output.

Concrete Products

Ajax Brick Co., Ltd., Leaside, Ont., Canada, has established a concrete brick plant north of Leaside to make concrete brick. The company has an office in the Federal building, Toronto.

Pacific Lock Joint Pipe Co., Seattle, Wash., has purchased property, total about 5 acres, at the foot of 87th street, vicinity of G street, Oakland, and plans to use a portion of the site for the early erection of a new branch plant for the manufacture of concrete pipe, culverts, and kindred products. The initial works are expected to cost about $50,000.

Personals

William N. Beach, president of the Pennsylvania Cement Co., with offices at 131 East 46th street, New York City, is paying his annual visit to Fairbanks, Alaska, according to a report in an Alaska newspaper just received.

Charles M. Carman, connected with the Western States Portland Cement Co. for a number of years, as mechanical engineer and assistant manager, has been named manager of the **Atlas Portland Cement Co.**, plant at Parsons, Kans. He succeeds A. D. Stancliff, who was promoted to assistant general superintendent at Northampton, Penn.

L. A. Babcock, for the last nine years sales manager of the Byers Machine Co., Ravenna, Ohio, resigned from the company on September 15. While giving up active association with the company, Mr. Babcock retains his financial holdings there, the change giving him the opportunity to devote time to important and growing outside interests.

Obituaries

George Lasker died in his eightieth year at his home at 83 Grove avenue, Toronto, Ontario, Canada. He was born at Naponee in 1844, where he carried on the business of lime and cement manufacture.

H. K. G. Bamber died recently in London, from injuries received in an automobile accident. Mr. Bamber was for 24 years managing director of the Associated Portland Cement Manufacturers, Ltd., and for 12 years, managing director of the British Portland Cement Manufacturers, Ltd., both of which positions he relinquished at the end of last year.

Manufacturers

Russell Grader Manufacturing Co., University avenue, S. E., Minneapolis, Minn., manufacturer of road and farm machinery, etc., has preliminary plans for a one-story factory in the industrial district.

Chicago Pneumatic Tool Co., Chicago, Ill., by an agreement with the Schurs Oil Burner Co., Los Angeles, becomes United States distributor for Schurs oil burners for brick, tile, sewer pipe, etc. A stock of burners will be carried at all branch service stations and trial installations will be made for those contemplating their use.

Symons Brothers Co., Railway Exchange Bldg., Milwaukee, Wis., original designer, manufacturer and selling agents of Symons disk crushers, announces that it is now personally handling both the manufacture and sales of its machines. These crushers which, for a number of years were manufactured and sold by Chalmers & Williams, Chicago Heights, Ill., will now be made in Milwaukee, and both the manufacturing and the service will be under the direction of the Symons Brothers Co. Offices are maintained in Los Angeles, at 1462 Stanley avenue, Hollywood, and in New York City, at 120 Broadway.

Trade Literature

Weller Manufacturing Co., Chicago, Ill. Circular describing skip hoists for handling sand and gravel, abrasive materials, etc.

Ironton Engine Co., Ironton, Ohio. Bulletin 552 on quick-removable battery compartments on locomotives made by this company.

Universal Hoist and Manufacturing Co., Cedar Falls, Iowa. Folder describing the Style No. 2 reversible hoist, operated by the "New-Way" air-cooled engine.

Smith Engineering Works, Milwaukee, Wis. Bulletin 261 D, describing the "Telsmith" primary breaker and the "Telsmith" reduction crushers. This is an attractive circular, illustrated by excellent halftones, showing both general views and sectional views. Tables of specifications, and a chart giving screen analyses are included. Bulletin 264-A just out contains the latest information on the Telsmith jaw crushers.

Ruston & Hornsby, Ltd., Lincoln, England, has recently issued Catalog 4632, illustrating and describing the company's vertical-type oil engine. This is an attractive looking piece of trade literature of 40 pages and is profusely illustrated with halftones in sepia. A number of installation views are shown, and tables of specifications are included. Anyone interested may obtain a copy by addressing the company direct, or by writing to the New York representative, T. R. Brown, 33 W. 42d street.